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# A Brushless Paint Shop

## Air Brush for Painting Metal Parts and Stream from a Flat Nozzle for Varnishing —Drying Temperatures and Other Conditions

BY GEORGE D. BABCOCK*

In line with the improvements of machinery and methods for mechanical work, there has been a development no less marked in the art of applying protective coatings to the surfaces of different materials. This subject has heretofore been indicated by the term painting, but under modern methods one of the elements considered essential to painting, the hair or bristle brush, has practically disappeared. Dipping, draining and drying; flowing, draining and drying; and applying with the air brush and drying—these are the substitutes for the hair brush method.

The practice of dipping articles in a liquid protective coating and of subsequent dripping and drying is practically as old as the harvesting machinery industry.

Applying coatings with an atomizing air brush has only within the last two years reached a prominent position in industrial work, previously being used in the preparation of canvases for art. More recently still, in fact practically a development of the last year, has come the process of stream flow-

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Fig. 1—The Excess Varnish Applied by the Flowing Nozzle Drips to the Retaining Pan, and Flows to the Centrifugal Separator at the Left for Cleansing and Mixture with Fresh Supplies

ing of varnishes. This process is the application of liquid coatings by means of a wide flat nozzle through which the coating is forced to flow continuously upon the surface in a wide ribbon-like stream.

As in all new processes skepticism early took the place of scientific study, and the question of durability, cleanliness and brilliancy were long debated before the present practical adoption of the methods. The virtue of these late methods has been proved conclusively for each of the above-mentioned points.

The protection of the exposed surfaces of automobiles from the elements affecting them has required most intensive study since the beginning of the industry. Different kinds of soils, as well as different conditions of air, do not act alike on protective coatings. The continuous exposure of these coatings on the automobile requires that they be not only perfectly prepared and applied, but selected to resist the special destructive influences.

Japanning or painting aluminum surfaces presents now no particular problem to secure permanency and luster. Steel and wood have long since ceased to be troublesome.

Ten-day rubbing varnishes are dried in four and one-half hours with improved luster, cleanliness and durability.

The flowing of varnishes with the nozzle method leaves a coating as thick as will adhere to the surface.

Air drying required many coats relatively thin. High temperature drying with humidity control and frequent air change gives better results by a thoroughly oxidized, tough, thick, varnish film. After such drying the film does not seem to crack or alligator as do numbers of thin air-dried coats.

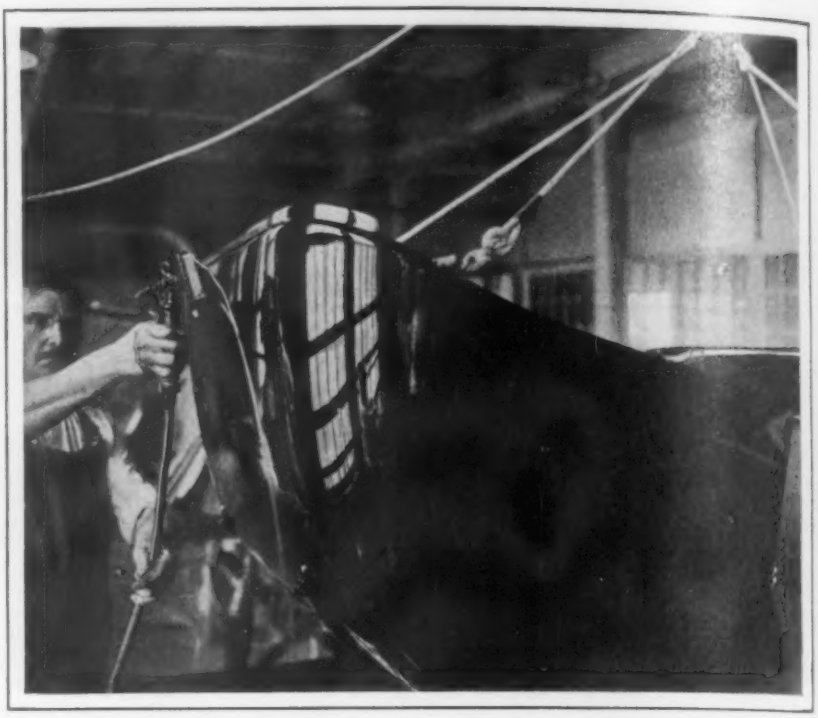


Fig. 2—The Flat Stream from the Nozzle Washes off the Dirt and Gives a Thick, Uniform Coat of Varnish

In the accompanying table are shown the principal elements involved in preparing a few automobile parts with durable, clean and bright finishes in minimum time as practised at the H. H. Franklin Mfg. Company's plant.

Figs. 1 and 2 show how the flowing of the automobile body is done. Brewster green color varnish is used with the DeVillbus Floco equipment. The top outlines of the body are first brushed, to prevent spattering on the interior, and then the wide flowing nozzle is passed over the entire surface until the varnish not only washes off any dirt upon the surfaces, but flows in a thick uniform coat. The body is then allowed to drip and after a short period of air drying is put into the drying ovens, Fig. 3, which are heated and humidified by the Greeff Engineering Company's equipment. This varnish coat dries in four and one-half hours. The varnish which drips from the body flows back through a filter into a retainer, and at frequent intervals it is

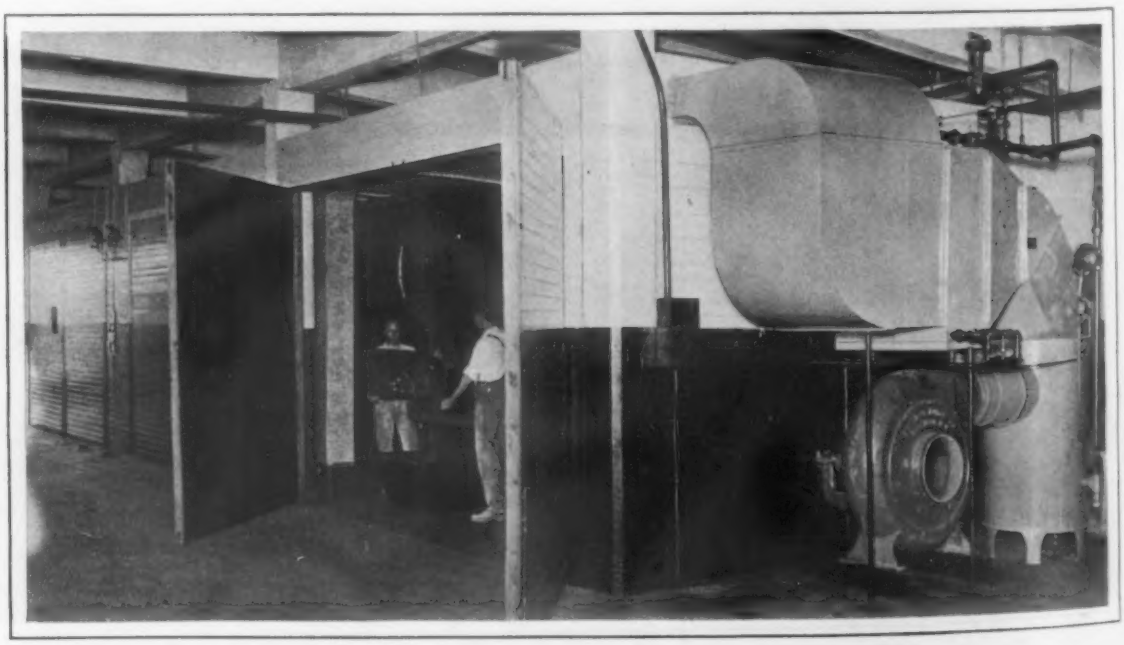


Fig. 3—The Drying Ovens Are Provided with Air Heating and Humidifying Equipment

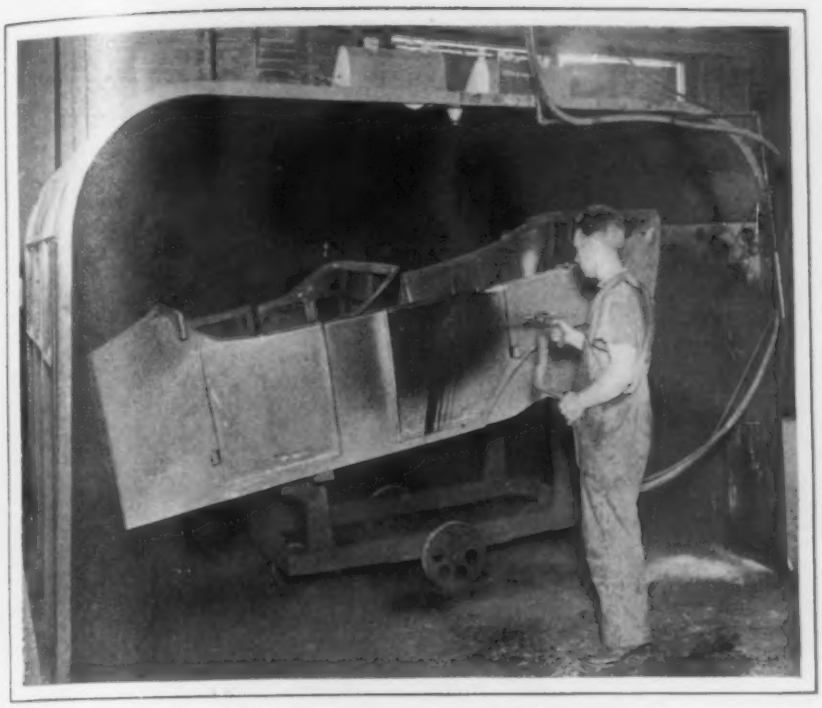


Fig. 4—The Hood for Air Brush Painting Has Ventilating Fans at Rear and Electric Lights at Top in the Front

separated by means of a De Laval Separator, as shown in Fig. 1. This cleanses the varnish and it is used repeatedly; the new varnish being continuously added to that in use. In the far rear of Fig. 1 is shown the so-called rough-stuff coating of the hoods by means of the atomizing air brush, after which they are coated by flowing as are the bodies.

Fig. 4 shows how the lead coat is applied with the DeVillbus atomizing air brush. A ventilating hood covers the work to take off the fumes. In the rear of the hood is shown the electric suction fans, and at the top of the hood may be seen the electric lamp enclosures for close illumination. One hose to the brush leads from the air pressure tank and the other from the liquid finish to be applied. The air brush spray is moved rapidly over the surface and gives a smooth uniform stippled coating. (The run, as it is called, shown in the photograph, was due to the operator's holding steady for the photograph.)

Wheels are charged to an air brush hood by means of the rolling conveyor as shown on each side of the hood in Fig. 7. After the varnish coats are applied the wheels are placed in a revolving dryer, where the varnish is allowed to set by air drying. The uniformity of the coat is maintained by the continuous rotation of the wheels. After air drying, the wheels are heat dried in ovens.

Fig. 6 shows how the axles are finished, all coats being given with the air brush.

Japanning plays an important part in the protective coatings of an automobile. After dipping in the japans, the parts are hooked upon trolleys, as shown in Fig. 5, suspended by brackets from the ceiling and allowed to drip over the pans. They are then run into the drying ovens and baked at the temperatures as shown in the table. The indirect Gehnrich ovens, shown in this illustration, do not allow the burnt gases to act upon the japans. All products of combustion are carried up the sides of the ovens in the tubes as shown. There are no draughts needed in the oven to maintain the burn-

*Materials Used in Coating Metal Automobile Parts and Methods and Conditions of Applying and Drying*

| Part | Operation | Preparation of Surface | Material in Coat | Means of Applying Coat | Means of Drying Coat | Temperature Drying Coat | Drying Time Required | Means of Rub on Coat |
|---|---|---|---|---|---|---|---|---|
| Aluminum body | 1 | Wash | Gasoline | Brush and wipe off | Air | Varnish dry, oven humidity 20 deg. less than dry | | |
| | 2 | Prime | Oxide and oil | Air brush | Ovens | 115 deg. F. | 3 hr. | |
| | 3 | Putty | Coach putty | Hand | Air | | 12 hr. | |
| | 4 | Half and half coat | Lead and rough stuff | Air brush | Ovens | 115 deg. F. | 3 hr. | |
| | 5 | Four coats. | Rough stuff | Air brush | Ovens | 115 deg. F. | 2 hr. each | |
| | 6 | Rubbing coat | Rough stuff | Hand | Air | | | Pumice stone |
| | 7 | Sand and re-putty | Coach putty | Hand | Air | | 12 hr. | |
| | 8 | Color coat | Green | Air brush | Air | | 6 hr. | |
| | 9 | First coat color | Varnish | Flowing machine | Ovens | 120 deg. F. | 4 hr. | |
| | 9 | Second color | Varnish | Flowing machine | Ovens | 120 deg. F. | 4 hr. | |
| | 10 | Clear rubbing | Varnish | Flowing machine | Ovens | 125 deg. F. | 4½ hr. | |
| | 11 | Rub out | Varnish | Hand | Ovens | | | Flour pumice |
| | 12 | Finishing | Body finishing varnish | Hand brush | Air | | 36 hr. | |
| Aluminum guards | 1 | Wash with | Gasoline | Brush and wipe off | Air | | | |
| | 2 | First coat | One-half enamel, one-half oxide | Dipping | Ovens | 375 deg. F. | 2¼ hr. | Sand paper |
| | 3 | Second coat | Enamel | Dipping | Ovens | 375 deg. F. | 2¼ hr. | Sand paper |
| | 4 | Finish coat | Enamel | Dipping | Ovens | 390 deg. F. | 2½ hr. | |
| Steel and aluminum axles | 1 | Wash with | Gasoline | Brush | Air | | | |
| | 2 | Prime | Oxide metal primer | Air brush | Air | | 18 hr. | |
| | 3 | Putty glaze | Coach putty | Hand | Air | | 12 hr. | Sand paper |
| | 4 | Second lead | Lead coat | Air brush | Air | | 15 hr. | |
| | 5 | Ground coat | Brewster green | Air brush | Air | | 10 hr. | |
| | 6 | Color varnish | Brewster green | Air brush | Air | | 18 hr. | Steel wool |
| | 7 | Finish | Gear varnish | Air brush | Air | | 24 hr. | |
| Wood sills | 1 | Prime | Oxide primer | Air brush | Ovens | 120 deg. F. | 18 hr. | Sand paper |
| | 2 | Putty | Coach putty | Hand | Air | | 12 hr. | |
| | 3 | Ground coat | Colored lead | Air brush | Air | | 15 hr. | Sand paper |
| | 4 | Color varnish | Black | Air brush | Ovens | 120 deg. F. | 18 hr. | Steel wool |
| | 5 | Finish | Gear varnish | Air brush | Ovens | 125 deg. F. | 24 hr. | |
| Wood wheels | 1 | Prime | Oxide primer | Air brush | Ovens | 115 deg. F. | 10 hr. | Sand paper |
| | 2 | Putty | Coach putty | Hand | Air | | 12 hr. | |
| | 3 | Rub. filler | Rub. filler | Air brush | Ovens | 115 deg. F. | 12 hr. | Steel wool |
| | 4 | Color | Green | Air brush | Air | | 6 hr. | |
| | 5 | Color varnish | Green | Air brush | Ovens | 120 deg. F. | 10 hr. | Steel wool |
| | 6 | Stripe | Black | Hand brush | Air | | 2 hr. | |
| | 7 | Finish | Gear varnish | Air brush | Ovens | 120 deg. F. | 10 hr. | |

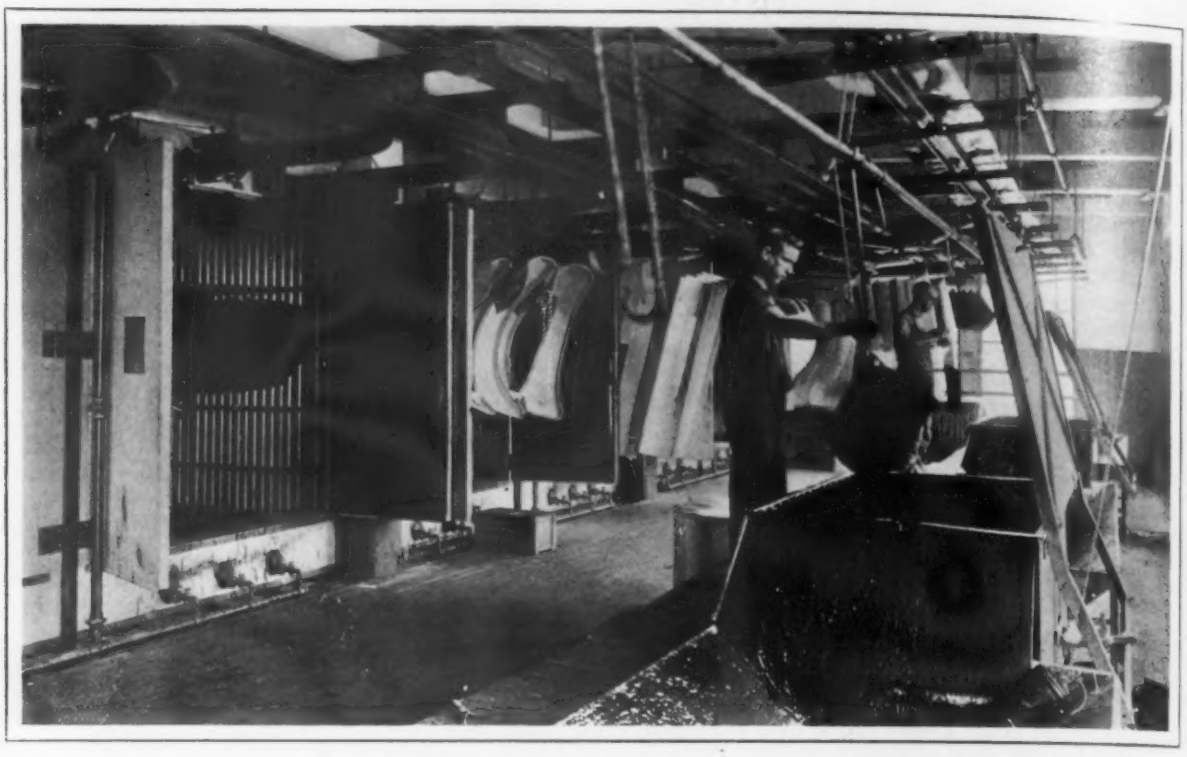


Fig. 5—Parts for Japanning are Carried on Trolleys, and Dried in Ovens with Tube Heating Surface to Keep Out Dust

ing gas, and therefore none of the dust from the room is carried into the oven and deposited on the work.

## Lathes with Metric Change Gear Boxes

The Cincinnati Iron & Steel Company, Cincinnati, Ohio, is equipping its 14 to 18 in. engine lathes with a metric quick change gear box. In its general construction and operation the metric head is the same as the regular type of head. There are, however, a few special features about the change gear box, one being that all the changes are secured without transposing or changing any of the gears and another that the reverse is incorporated within the gear box instead of being in the end of the headstock. This location is within easy reach of the operator and enables him to operate it instantly. On account of its location at the head of the lead screw, the change gears run in the one direction.

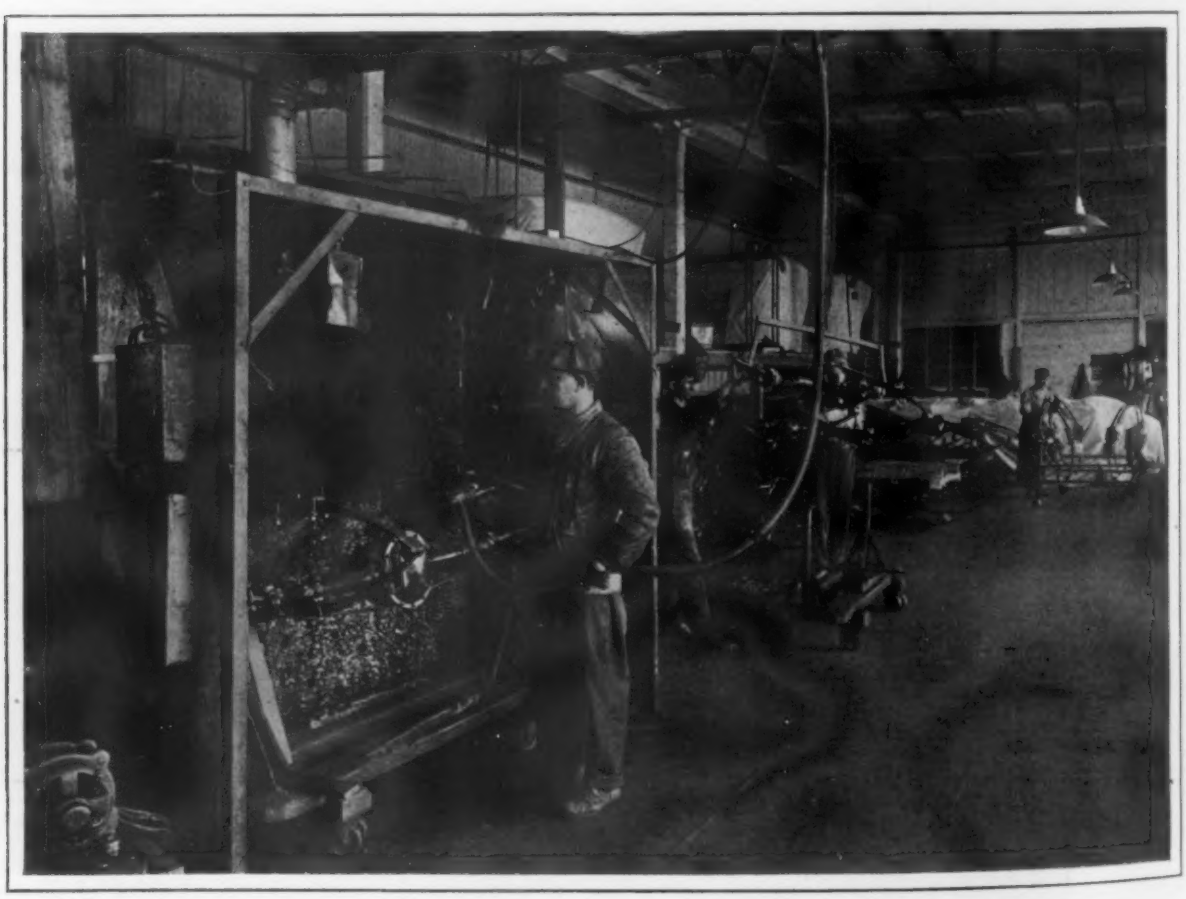


Fig. 6—Axles, Finished by Means of the Air Brush, are Carried on Special Buggies to the Painting Hood

# DETAILS OF RUSSIAN SHRAPNEL

## Requirements as to Loading and the Finish of Interior Parts

BY H. M. DAVIS

While most of the shells manufactured in this country have been sent abroad for loading, some of the contracts have specified complete projectiles, and the tendency to do this will undoubtedly increase if the war is prolonged. Hence the following details embodied in an American contract for 3-in. Russian shrapnel to be used in field guns of British manufacture will be of interest:

After the parts are ready for assembling, the powder pocket, the under surface of the lower diaphragm and the inside surface of the central tube must be lacquered. Bullets making up the charge consist of a composition of four parts of lead and one part of antimony by weight, the caliber being ½ in. and the weight of each bullet 0.0234 lb. For each shell 258 to 260 bullets are used. After the first four layers of bullets, the so-called "smoke-moisture," weighing 0.0516 lb., is put on; then the remaining bullets are added, with a matrix of melted resin, and lightly pressed down.

The "smoke moisture" consists, by weight, of 45 per cent magnesium powder and 55 per cent antimony sulphide derived from stibnite concentrate. When the shell explodes, this and the resin matrix combine to create a dense white cloud of smoke, and its object is to serve as a tracer for locating the spot where the shell bursts. In firing shrapnel particularly this is a matter of the utmost importance, as otherwise the artillerymen cannot tell whether a hit or miss has been scored and correction of the range is made correspondingly difficult.

In the steel shrapnel head are two threaded holes for inserting the charge and for the escape of gases. After filling, the holes are closed by screwing in steel plugs. The weight of the shrapnel, when charged, is stated in the specifications as 14.29 English pounds. The fuse used for Russian shrapnel is of the double-banked type which embodies a combination of timing and precussion features. This constitutes an entirely separate article of manufacture and is usually added at destination. For shipment from this country the shells are ordinarily delivered with zinc bushes put on in place of the fuses.

In respect to "finish" the Russian specifications are very particular. On the exterior and interior surfaces, they say, "either scratches or chaps however small" will not be permitted. The outside may show "separate excavations coming from scoria, but these should be very insignificant." The head is to be made from steel of the same analysis as the body and "no scratches or porosity will be allowed." The diaphragms must be pressed from steel, also of the same quality as the case, and are to be finished on the peripheries and bottom faces, with central holes drilled. The exterior and interior of the central tube must be "smooth" and the ends "cut perpendicularly to the axis," but the quality of the steel is not specified.

"The case," it is stated, "must be finished on all parts as follows: The outside surface, bottom, powder pocket, diaphragm seat and the part of the inside surface corresponding to the (upper) diaphragm. The inside surface of the case *in the parts which are not finished*, must be clean and level." This, therefore, eliminates the necessity for more than rough boring, as the diaphragm seats can be simultaneously reamed in the same operation.

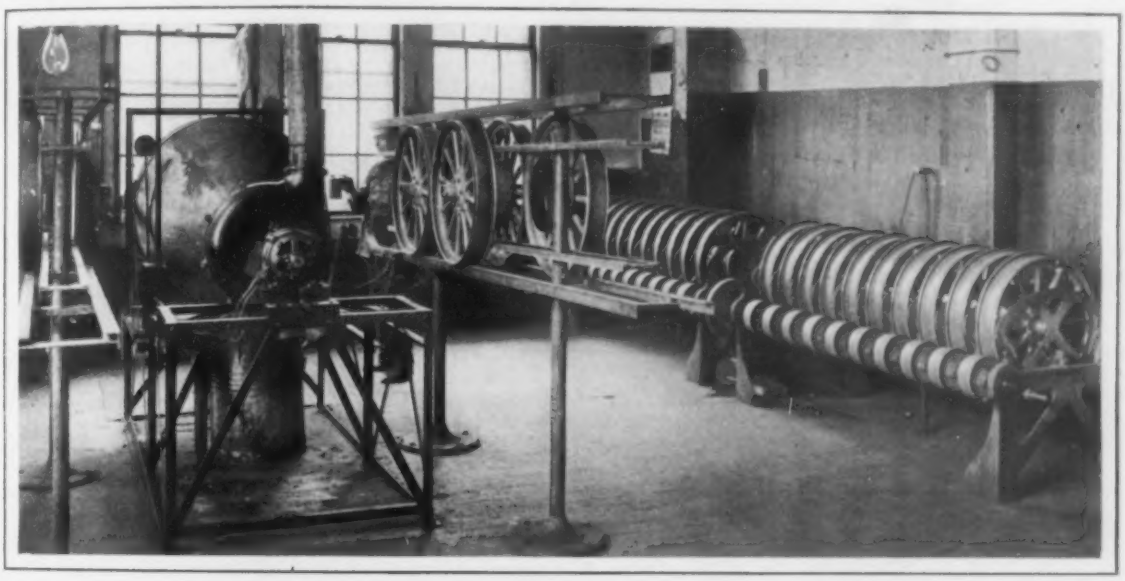


Fig. 7—The Wheels are Treated with the Air Brush and are Revolved While Drying in the Air

Copper used for the driving band is to be tested by having the bars bent cold and also by forging. "Afterwards they are to be examined with regard to shape and chaps. A copper bar having a chap longer than one-tenth of its length is to be rejected." The depth of the "gnarling" (waving) in the band groove must not exceed 0.005 in.

In other respects provisions for the manufacture of Russian shrapnel conform closely to those already given in THE IRON AGE for the shells of other nations.

## Revolving Ventilator with Ball Bearings

In addition to its sliding sleeve damper ventilator, the Burt Mfg. Company, Akron, Ohio, is marketing a revolving ventilator equipped with ball bearings. The ventilator is designed to cause exterior air currents to pass directly through the ventilator as well as across the top and sides, in creating the partial vacuum for accelerating the pull of the ventilator, as it is called. The ventilator, it is stated, is held steady with the wind and does not revolve continuously.

The Brown Hoisting Machinery Company, Cleveland, Ohio, has taken an order from the Russian Government for nine locomotive cranes, this being in addition to an order for 38 locomotive cranes placed with this company by Russia a few months ago.

# The Electric Furnace in the Foundry*

## The Construction and Operation Based on Modern Experience—Electrodes and Their Grouping in Larger Furnaces—The Current Phase

BY JAMES H. GRAY

Electricity as a source of heat has been considered seriously in connection with the manufacture of steel only in recent years because, as a simple competitor of coal and gas, it is expensive. When, however, it was recognized that, by the use of heat free from the contamination of oxidizing conditions, chemical reactions and metallurgical operations were made possible which could not be performed by our older methods, and that not only could the dead melting operation of the crucible be duplicated, but that materials containing objectionable ingredients could be refined, and give a steel equal to the best quality known, then the use and development of the electric steel furnace grew rapidly.

So far invention has given us two methods only of applying electric heat to the steel furnace—the direct application of the arc to the charge in the arc furnace, and the generation of heat in the metallic charge by means if induced electric currents in the induction furnace. In the arc furnace, the molten charge is cooler than the slag and this is a desirable condition, as the slag has a higher melting point than the steel. In the induction furnace the heat of the slag is derived from the steel, while the space above the slag is quite cool. Thus while it is possible to acquire a temperature and fluidity of the slag by which certain chemical reactions may be carried on between the slag and the metal in the induction furnace, this cannot be accomplished as readily and satisfactorily as it can be done in the arc furnace.

While the arc steel furnace is merely a hearth on which steel is made, the source of heat being the arc, just as flame is used in other furnaces, the induction steel furnace is really an electrical apparatus, as it contains within itself the transformers which induce the heat in the charge.

I consider that the construction and further development of the induction furnace is more the task of the electrical expert than it is of the practical furnace man or the mechanical engineer. This paper is confined then to the arc type of electric steel furnace.

### AN IDEAL ELECTRIC FURNACE

An ideal electric furnace is one whose shape is a sphere. The charge would be a metallic sphere and would be located in the center of the spherical furnace much as the yolk of a hard boiled egg is enclosed by the white of the egg. The walls of the furnace would be perfect insulators of heat and perfect conductors of electric current. The amount of current applied to the charge would then be so great that it would be melted in an exceedingly short time. When the heat was finished the furnace would split open and the charge be instantaneously ejected.

Very practical considerations permit us to only distantly approach this ideal. The charge when molten will lie in a pool and the bottom of the furnace must be saucer shaped. Doors have to be opened for the purposes of charging, manipulating slags, taking tests and making alloy additions. If we insulate the furnace too well we find that our refractory lining will melt. To introduce electric current we have to avail ourselves of the kind of current and the means of handling it most adaptable to our conditions. Therefore, our furnace is a compromise in many ways.

### THE HEARTH AND LINING

For materials suitable for making the furnace hearth or bottom, we are practically confined to two—magnesia and silica. The basic electric furnace, just as the basic open-hearth furnace, permits the use of a basic slag covering for the metal bath which, reacting chemically with impurities in the metal, remove them. By the use of oxides in the slag phosphorus may be removed, but the electric furnace does more; it can work under reducing or deoxidizing conditions which make it possible to remove sulphur and the still more objectionable element oxygen.

With an acid furnace phosphorus and sulphur cannot be removed, but excellent steel can be made from high grade materials by "dead melting," as in the crucible, and by deoxidizing the steel by the aid of the nascent silicon, which is reduced from the silica of the slag. However, there are two difficulties in this connection. If a truly reducing or deoxidizing condition is maintained, so much silica is liable to be reduced to silicon that the steel will be too high in silicon. If oxides are introduced to burn out the excess silicon, or worse yet, if no slag is carried except that coming from the melted rust of the scrap, we have no better condition than that existing in the acid open-hearth furnace.

### THE BASIC BOTTOM

The best basic hearth is made by placing next to the steel shell of the furnace magnesia brick and then forming a hearth of bowl shape by sintering in grain magnesia which is a species of calcined magnesite. The most suitable kind of magnesia is that which contains in its natural form a certain amount of iron oxide, as pure magnesia is too refractory for the purpose. Even with this material, it is advisable to mix with it from 10 to 20 per cent of open-hearth slag to make it sinter or frit more readily.

One method of burning in the hearth is to make a plastic mass of magnesia, slag, hot tar and pitch, and ram in the hearth to the desired outline with hot rammers. Then a bed of coke is placed in the furnace and the electrodes lowered upon it. On the passage of current, small arcs form throughout the mass of coke and it soon becomes incandescent. After maintaining this high heat on the hearth for several days, it is burned to a sufficient depth to make it serviceable, but the sintering cannot be forced as far as the brickwork of the bottom.

I have found a more satisfactory method to be that of placing a thin layer of magnesia over the magnesia brick and bringing this up to a white heat by means of the arcs. When a sample gouged from the bottom shows that it is no longer granular, but a plastic mass, another layer of magnesia is added and sintered to the first, and the process is repeated until layer by layer the hearth is built up to the desired contour. It is then one monolithic block. Of course, this procedure is possible only in those furnaces which have the electrodes so disposed as to admit of it and requires about 36 hours. It is the same method which is employed in making open-hearth bottoms in America, except that with the heat of the electric arc the time consumed is much less in the electric furnace.

Having a good bottom to start with, the corrosion about the slag line is repaired after each heat by throwing in a few shovelfuls of dolomite, either calcined or raw. Such a bottom lasts for an indefinite number of years without ever removing it for complete replacement. Dolomite, which is a combination of magnesia and lime, can also be used for making the hearth and even lime has been used for fettling. This is done in Europe more than in America.

### THE ACID BOTTOM

To make an acid hearth, it has been found prefer-

*From a paper read at the annual meeting of the American Foundrymen's Association at Atlantic City, Sept. 30, 1915. The author is with the United States Steel Corporation, New York.

able to build up the entire hearth to the correct contour of silica brick and dust it over with silica sand. Silica brick is less expensive than magnesia brick but it is more difficult to burn in a satisfactory bottom of sand than one of magnesia.

The prime consideration in securing a sound and lasting hearth is to have it as simple as possible. It should not be complicated by any water-cooled, air-cooled or semi-molten metallic parts or connection; neither should the bottom be composed of or contain conducting but non-metallic substances. These devices, which break up the continuity of the bottom, may be put up with in a hearth of small size, but those of us who have had experience with open-hearth furnaces know what "steel in the bottom" or "a hole in the bottom" means in loss of production and higher costs with a hearth of any considerable dimensions.

### WALLS OF SILICA, MAGNESIA OR CHROME BRICK

The walls of a basic furnace above the slag line may be made of silica, magnesia or chrome brick. Magnesia brick is the most satisfactory as regards its life and the effect on banks and slag of drippings from the walls, but its high cost will equal the cost of brick and labor for several silica walls. Chrome brick, although too soft a material under heat to be used in high walls, may be used in the low walls of an electric furnace very successfully, provided that there is no objection to a small quantity of chrome being reduced from its oxide into the steel which is specified for any particular purpose. As the chrome ore, of which the brick is made, is neutral to bases and acids, it does not cut the banks when it drips on them, and the chrome brick walls are not cut by the molten silica which runs over them from the fluxing of the silica roof, as is the case with magnesia brick. Silica brick, though cheaper than the other two, of course, is not affected by the molten silica running over the skew back from the roof. However, it is attacked by lime fumes volatilized from the slag by the heat of the arc.

Also if, because of opening the doors too often, or having to shut the furnace down at intervals, the electrodes become pointed by oxidation, or if the arc be too long thus causing heat to be reflected by the slag to the walls, the silica brick, being less refractory than the two other kinds, is melted readily and runs down over the basic banks into the slag, cutting the banks and often causing the slag to be too acid. It is apparent then that the material to be used for the walls must be chosen after considering the various conditions under which any given furnace has to operate.

The roof can be of silica only, as no basic material has yet been discovered which will stand in the form of an arch of any appreciable span without spalling. The material for lining the acid furnace is silica throughout. Various other materials have been suggested for electric-furnace work, but either their excessive cost or their failure to serve the purpose have prevented their general use.

### THICKNESS OF WALLS AND ROOF

In my ideal furnace I mention perfect heat insulation. Unfortunately, the refractories at our disposal will not stand up under constantly applied high temperature. Heat applied at one end of a brick will cause it to melt, unless the heat is drawn away at the other end of the brick. Paradoxical though it may seem, ingenuity must be used to ventilate and draw heat away from the brick work, instead of trying to insulate it. In the electric arc we have a source of heat of 100 per cent efficiency. To make the efficiency of the furnace as high as possible we must endeavor to concentrate the heat in the charge—bury the arc in the charge while melting, and hold it down on the bath after melting and to accomplish the work in the shortest time practicable. Then when we have compelled our kilowatts to do their utmost in the charge, the excess or unused heat should be carried away rapidly enough to leave intact the refractories which form the furnace. It is by these means that the charge and not the furnace is made to absorb the majority of the heat, and the radiation is reduced, not by insulation, but by cutting down the time during which it acts.

A practicable thickness for walls is from 13 to 18 in. I consider the best thickness for the roof to be 9 in. It can be observed that when a furnace is new and the walls and the roof are at their thickest the consumption of kilowatts is smaller than later in the campaign, but it is also noticeable that the first few inches of brickwork go much faster than the last, and that we get the real service out of the brickwork after it is thin enough so that heat is rapidly conducted away to the atmosphere. An extreme application of this principle is seen in certain Girod furnaces, where the roof is only 4 in. thick and where an air blast is used to cool and preserve the brickwork.

### THE ELECTRODES

Many expedients have been tried to provide for the arc electric furnace suitable electrodes and connections, but for steel furnaces all have given away to simple carbon electrodes made in sections of convenient length, joined together by a nipple or screw thread which permits them to be fed into the furnace through the electrode holder so as to consume the whole electrode without loss by butts. The forms of carbon used are either graphite or amorphous carbon. The graphite electrode may be graphitized after it is molded of amorphous carbon, or it may be molded of graphite in the granular form.

The advantages of the graphite electrode are its high conductivity and its greater freedom from breakage and its ease of manipulation. The fact that it costs more than the amorphous carbon electrode prohibits its use where a few cents' saving per ton of steel is considered important, as is the case with production on a large scale. Graphite is also a better conductor of heat, as well as of electricity, and accordingly the reduction in size of electrode by the use of graphite is not all gain.

In my ideal furnace I considered the medium which enveloped the charge to be not only a perfect refractory, but also one big electrode. The nearest approach to this condition would be to have the bottom entirely made of carbon, and have the roof consist of one very large electrode, there being no walls to the furnace. In a steel furnace carbon cannot be used for the bottom, as the steel would soon be pig iron. The second compromise with the ideal would be to have the charge entirely covered with an electrode divided by insulating planes into two or three sections, according to the kind of current to be used. This arrangement being impracticable, the next suggestion would be a multitude of small arcs in a great cluster which would entirely cover the charge. In this way the charge would be attacked at as many points and over as great an area as possible. Of course, the question of regulating apparatus, holders, roof coolers, accessibility to the furnace for taking tests and making additions, restrains us again.

The best solution is to have the electrodes as large as practicable, considering what is obtainable commercially and what will harmonize with the other necessities of good furnace design, and to increase the number of electrodes when these considerations and the size of the bath demand it.

### NUMBER AND SIZE OF ELECTRODES

Carbon, when kept away from oxygen, is one of the very best refractories, and if the arc can be maintained under a relatively large surface of carbon its heat is thrown down on the bath in the form of a hemisphere. If the electrode be very small and pointed the arc radiates heat in all directions as a sphere, and the roof and walls suffer. In those furnaces where the electrodes enter the furnace horizontally this is also true, and it has been found extremely difficult to maintain a roof on those of small size, and impossible on those of large size. The consumption of kilowatts per ton of steel produced is greater with this type of furnace, where the heat is radiated from the arc equally upward and downward.

Assuming that the furnace is of such size that the

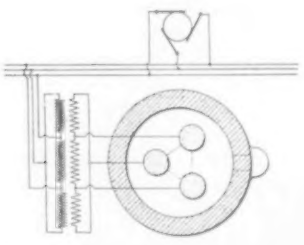
minimum number of electrodes will be used, the number will depend on the kind of current and on whether or not electric connections through the bottom are used. With bottom connections a single-phase furnace will require one electrode; 2-phase, two electrodes, and 3-phase, three electrodes. If no bottom connections are used, that is, if the electrodes are vertical and are in series, the current passing from one to the other through the bath after striking arcs with the bath, or if the electrodes are arranged so as to maintain the arc above and clear of the bath, then a single-phase furnace requires two electrodes; 2-phase, four electrodes, and 3-phase, three electrodes.

It must be borne in mind that a bottom connection is not a substitute for an electrode, though the number of electrodes may be thereby reduced because a certain number of amperes must be carried through the electrodes to furnish a given number of kilowatts, and the cross-section of electrodes must in both cases be the same for the same kilowatts and arc voltage. It will be noticed that for a 3-phase furnace the number of electrodes is the same whether a bottom connection is used or not.

*Table 1—Size of Electrodes Found Satisfactory in Practice*

| Size of Furnace, Tons | Transformer Capacity, Kva. | Amperes, Each Phase | Amorphous Carbon: Size of Electrodes | Amorphous Carbon: Amperes per Sq. In. of Electrodes | Graphite: Size of Electrodes | Graphite: Amperes per Sq. In. of Electrodes |
|---|---|---|---|---|---|---|
| 15 | 3,000 | 18,000 | 24 | 40 | 12 | 160 |
| 10 | 2,000 | 12,000 | 20 | 38 | 10 | 152 |
| 6 | 1,200 | 7,200 | 17 | 32 | 8 | 144 |
| 4 | 900 | 5,400 | 14 | 35 | 7 | 140 |
| 3 | 750 | 4,500 | 14 | 29 | 7 | 116 |
| 2 | 600 | 3,600 | 12 | 32 | 6 | 128 |
| 1 | 375 | 2,250 | 8 | 45 | 4 | 180 |

The electrode holder should be so constructed as to form a good electric connection with the electrode and at the same time be easily tightened and loosened. It should be water-cooled so as to prevent arcing at the connection, which destroys both cooler and electrode. If the holder is not cooled it expands with heat faster than the electrode and the latter is permitted to slip down. On very small furnaces where the weight of the electrode is small and the preservation of the holder of little moment, the water cooling may be omitted. Surrounding the electrode and resting on the roof should be a water-cooled collar or ring. The cold surface thus afforded causes the fumes which arise from the bath to condense on it and form a smut which seals the opening between the electrode and the collar. Thus the furnace is made more nearly air tight. Without this device the flame escaping through the opening would destroy the electrode and the size of the opening would gradually increase.



In Fig. 1 the Furnace is Circular and Incloses 3 Electrodes. As the electrodes are arranged in a triangle, the natural form of the furnace would be triangular, but the circular form gives a stronger structure and more practical design. The electrodes are connected in delta with the transformers and are arranged with the pouring out spout between two electrodes to facilitate slagging off

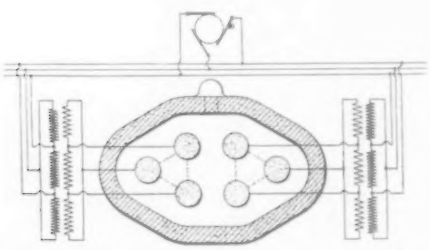


Fig. 2 Shows an Arrangement for Six Electrodes. Here two triangles are placed with their bases parallel and the triangular form of the furnace is more nearly adhered to considering each half of the furnace by itself. The two groups of electrodes are connected in delta with two separate groups of transformers. This arrangement is better than having the six electrodes form a rectangle, for thus we have a rectangular furnace, and with the viscous basic slags of the basic electric process it is better to avoid corners or level places where the slag will rest while the heat is being poured from the furnace. With these slags there is always a tendency for the bottom to build up, and if an accumulation of old slag from previous heats comes off the banks into the slag of some later heat there is trouble. This trouble is not experienced either in the bowl-shaped or triangular hearth

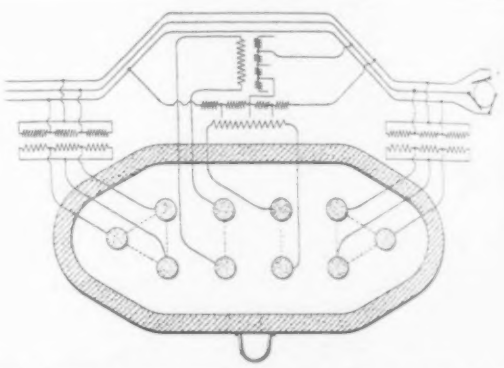


Fig. 3 Shows an Arrangement for 10 Electrodes in the Form of Two Triangles with a Square Between Them. The central group of transformers is connected with the Scott's connection so as to give 2-phase current, each phase of which passes through two of the electrodes of the square in series

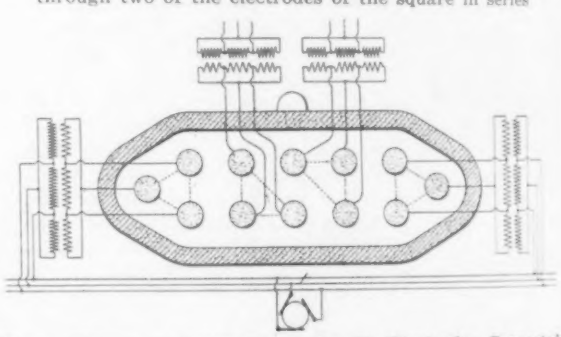


Fig. 4 Shows an Arrangement for 12 Electrodes Connected to Four Sets of Transformers. The two middle triangles may be connected either as indicated by dotted lines or the triangles may lap over each other with two corner electrodes connected to one central electrode on the opposite side of the rectangle. Both arrangements have been found to work equally well

### THE CURRENT PHASE

The question as to the current phase which we may best use, is practically settled for us, in America at least, because the current furnished by practically all power companies and that made in large industrial establishments is 3-phase. The reasons for the general adoption of this form of current are economic and will rule until some better method of generating and transmitting electric current is found. Supposing that the size of the furnace has gone beyond that in which one set of electrodes may be used, and that 3-phase current will be used, I give in Figs. 1, 2, 3 and 4 suggestions for the grouping of electrodes.

Table 1 shows sizes of electrodes which have been found to be satisfactory in practice. It will be noticed that the cross section of the electrode is not in absolute proportion to the size of the furnace. Account is taken of the commercial sizes of electrodes available, furnace design and increase in current required per ton charge for furnaces of smaller size.

*(To Be Continued)*

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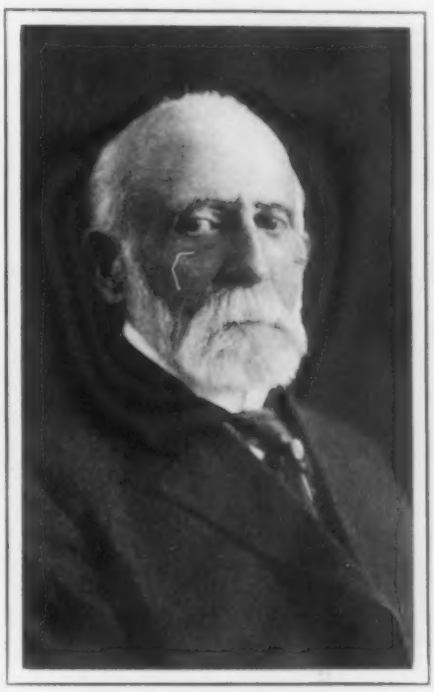
The first meeting of the 1915-1916 season of the Pittsburgh section of the American Institute of Electrical Engineers was held in Pittsburgh on Tuesday evening, Sept. 21, preceded by a dinner. A paper entitled "Outdoor Sub-Stations" was presented by B. W. Kerr, manager of the Railway & Industrial Engineering Company. The paper was discussed by prominent engineers.

## Death of Richard R. Williams

After a long illness, Richard R. Williams, universally recognized as the dean of hardware journalism, died at his home at Glen Ridge, N. J., Sept. 30, aged 72 years. For a period of over 30 years he had been the editor of *Hardware Age* and of its predecessor, the hardware department of THE IRON AGE, but for the past two years he had been in retirement by reason of ill health. He was perhaps more widely known in the hardware trade than any other man of his time. In the course of his editorial career he was almost invariably present at any considerable gathering of hardware interests and thus became directly acquainted with the members of the trade, his agreeable personality and wholesome friendliness winning the esteem of everybody. His hold on the trade was further cemented by his ability as a speaker, being ever ready to respond when called on to address an assemblage, when his felicity of expression, aptness of illustration and convincing logic made a lasting impression on his hearers. As an after-dinner speaker he was in constant demand. Another factor in winning and retaining friends was through correspondence, as he thus kept in constant touch with leaders in the trade in every section of the country. Few men have conducted so voluminous a correspondence.

A sketch of the career of Mr. Williams would be a tribute to the effectiveness of hard work and unremitting application. He was constantly studying how to make his paper of greater practical value to its readers. Quick to perceive the importance of some new development in the trade, he threw all his energy in the work of collecting the information necessary for its thorough comprehension and securing the views of the leaders in the trade as to its value and its effects. Thus the files of the paper became invaluable in showing the trend of thought and the development of new ideas in the hardware trade from year to year. But Mr. Williams was not merely a chronicler of events or a recorder of the views of others. He was a man of earnest convictions and deeply rooted principles and his editorial expressions were contributions of high value on current subjects of general discussion. He would not temporize with error nor would he gloss over an unsatisfactory situation but was fearless in taking and maintaining a position which his judgment approved.



RICHARD R. WILLIAMS

Richard Richardson Williams was born Sept. 19, 1843, at Waterford, Ireland. His father was John Williams, the founder of THE IRON AGE. The family, comprising his father, mother, two brothers and two sisters, came to the United States in 1851 and located at Port Jervis, Orange County, New York. After living there about four years the family removed to Middletown, N. Y., on account of the father's connection with the saw-manufacturing firm of Wheeler, Madden & Bakewell (subsequently the Wheeler, Madden & Clemson Mfg. Company), and with King, Cokayne & Co., manufacturers of files. At Middletown THE IRON AGE was first published, being then entitled *The Hardware Man's Newspaper*. Richard was graduated from Walkill Academy in that place, after which he spent some time in a law office, but did not continue to the point of being admitted to the bar. His preceptor, on retiring some years after, desired to turn over his practice to Mr. Williams, who declined the offer as he was then bent on continuing as a clergyman. In 1863 he accompanied the other members of the family when it was decided to remove the publication office of THE IRON AGE to New York City. Here he was for a brief period employed by the Russell & Erwin Mfg. Company, whose store was at that time located on the corner of Beekman and Cliff streets. While he was engaged with this company he got his first insight into the hardware business. Subsequently he was interested as a partner with his father in the sale of hardware on commission, but this venture did not develop permanency.

Having decided to become a clergyman, Mr. Williams entered the Union Theological Seminary, from which he was graduated, doing the work of a three-year course in two years, probably at the expense of his health, and was ordained as a minister of the Reformed Dutch Church, taking a charge at Canajoharie, N. Y. At this time he married Miss Mary Mitchell of New York City. His career as a pastor was highly successful, continuing about 14 years, and he was beloved by his people, but his health broke down and he was compelled to abandon the profession to which he had given so great a part of his life and youthful vigor. He then spent six months in rest and European travel with his brother David, who had bought THE IRON AGE from his father in 1868, and returned home in greatly improved condition, so that he was able to accept a proposition to join the staff of the paper.

The permanent connection of Mr. Williams with THE IRON AGE, which began in 1883, was really a continuance of work which he had done years before. After the removal of the paper from Middletown to New York City, and beginning in 1864, its reports of the iron and hardware market were written by him until he entered upon his professional career as a clergyman. On becoming a member of THE IRON AGE staff Mr. Williams devoted himself assiduously to the work of the hardware department, of which he was made the editor. It was not long until his energy, close attention to details and comprehensive grasp of the field made the hardware department of the paper of far more value to the trade than had previously been attained. The high standard thus established was unflaggingly continued to the end of his active career.

Exacting as his editorial duties were, Mr. Williams found time for other matters of importance. The Hardware Club was organized largely through his efforts and he served for two years as its president. The many State hardware associations and State mutual hardware fire insurance companies are indebted for their existence to his timely support, unstinted assistance and untiring co-operation. He was a resident of Brooklyn the greater part of his editorial service, where he took an active interest in religious and benevolent movements. He was superintendent of the Sunday School of the Classon Avenue Presbyterian Church for 20 years and was one of the pioneers in adopting graded work in Sunday School teaching. He frequently preached during this period, many clergymen feeling free to ask for his services when unable to occupy their pulpits. A favorite diversion was the game of chess, at which he was an expert. For years he was vice-president of the Brooklyn Chess Club, and it was largely due to his efforts that the international cable matches with Great Britain were instituted. He was a profound student all his life, having a special fondness for poetry and the classics, devoting much attention in recent years to Irish literature. He leaves his widow, two sons and a daughter.

# The Individual in Modern Management

## What Relations Are Aimed at Among All Members of the Industrial Organization—The Human Element at All Times Paramount

BY F. B. AND L. M. GILBRETH*

An industrial establishment, taken here as an object of study, is supposed to have settled upon its particular work and to be ready to undertake this work under the direction of the scientific type of management. It realizes that it has two component parts to be considered, as follows:

1. The men; that is, the organization.

2. The plant, which comprises everything except the organization; that is, the buildings in which the work is done, the tools and other equipment that are used in doing the work, and the entire arrangement and handling of everything except the human element.

There being these two elements, upon which of the two is the greater emphasis placed? Which occupies the larger amount of thought of those who are responsible for the management?

Right here arises one of the most confusing opinions as to what really takes place. In actual practice, when measured functional management is installed, it is customary to begin with material things. If a new building is to be built for the establishment, that occupies the first attention of the installers, and is considered for the time being of paramount importance. When old buildings have to be utilized, a large amount of time is immediately put in upon seeing if they can be better arranged, or better adapted to suit the purposes of the business.

The next item considered is, usually, the tools and equipment that are on hand. A "bought stores and worked materials stores system" is installed, and put in running order. The "routing" of the work will occupy time and attention. As soon as possible everything used during the working processes will be examined, analyzed, measured and standardized. New working material of various kinds may be purchased, and during all this time, and at times it may be a period of months and of years, apparently nothing is being done which directly affects the human element, but the phrase "directly affects" is a significant one.

### THE INDIRECT CONSIDERATION OF THE WORKING FORCE

As a matter of fact, absolutely nothing that is being done is without its effect upon the working force. The new buildings may be designed, or the old remodeled, rearranged or better utilized, to increase or conserve the energy of the worker. The tools and equipment are arranged, or improved, or augmented for the same purpose.

Besides this indirect effect, which shows itself mostly in an effect upon the manual activity of the worker, there is an effect upon his mind that is not only apparent, but that can be also very closely calculated. This effect shows itself in various ways. One is in bringing the workers themselves into a more friendly and co-operating attitude towards the type of management which is being installed. Another is in actually starting to train the worker to think in terms of elements of motions, of elimination of unnecessary waste, of decrease of fatigue, and increase of efficiency.

It is impossible for one to see the materials of his work coming to him and leaving him in a planned, directed and orderly stream without having his mental attitude and processes affected by the order and regularity. It is impossible to have your working equipment so arranged in accordance with the laws of motion study that you can reach with your hands anything you require, use it and return it to its resting place with the least amount of effort, without coming to think of that work in a new and entirely different manner. Your cross-sectioned table or desk, if you are an office worker, suggests to you that you not only keep the things that you use in an orderly manner, but that you think out that order in your mind. Fundamental laws suggest themselves, such as, for example, that those things used oftenest are to be given the "rights of position," as are the small type of the lower case in the printing shop. Your assembly table, or packet, or your tool stand, if you are in the shop, makes practically the same suggestions, and so it is in whatever line of activity you engage. It thus becomes evident that, while at the outset the emphasis seems to be placed upon the equipment element, in reality, even from the start, the human element is constantly being very closely considered.

### HUMAN ELEMENT CONSIDERED THROUGH FATIGUE SURVEY

Another important way in which the human element is considered from the start is in the intensive study made of fatigue, especially unnecessary fatigue. When the first survey of the work to be done is made, there is a special survey made, which is called the "fatigue survey." This concerns itself entirely with determining, as far as is possible at that stage, exactly what can be done, what should be done and what is to be done to cut out all needless or wasteful expenditures of human energy. The result of the fatigue survey, made at the very beginning of the installation, is that fatigue elimination is an important and often a determining factor in deciding upon the details of the design of building, tools, chairs and other equipment that are to be used, and is often the one reason for supplying additional tools or apparatus, whose direct result is reducing fatigue, and whose indirect result, or by-product, is an increased amount of, or a better quality of, product.

Usually the first evidence that the human element is being directly considered is in the making of the functional chart. This functional chart is a representation in a visual form of the human organization and the relation of its different members to one another. As soon as this functional chart is made, showing the present duties under present management, and even before the men are assigned to their new duties and functions, it must become clear to every member of the organization that in the final analysis the human element is the

*Consulting engineers, Providence, R. I.

most important element, and that it must be given the most attention.

CHART OF HUMAN ORGANIZATION OF THE PLANT

This chart, which covers all departments of the organization, as shown is specially related to the production department, indicating perhaps more clearly than could any other the exact relation of the human beings doing the work to the work itself. The circles represent the different types or functions of work that are being done. Those above the horizontal line concern themselves chiefly with the larger problems of laying out, or planning, the work; those below this line, with the carrying out or performing of the planned work. The top circle, No. 1, or the superintendent, is the directing force, and typifies the relationship between this department and the other departments of the organization, or of similar or related organizations.

The four other circles in the planning department represent the four types of men among whom the planning of the work is divided. The man, or group of men, in function No. 2, for in each case the circles may represent an individual or a group of individuals, according to whether the organization is large or small, decides *where* and *when* the work is to be done and by whom. The man in function No. 3 decides *how* the work is to be done. The man in function No. 4 keeps record as to *how long* various kinds of work have taken and *how much* they have cost, and is, therefore, in the position to furnish information that will help to predict the time that will be required to do new work. He might be expressed as the man who determines the *How much of time and cost*. The man in the fifth function is particularly concerned with the interrelation of the different members of the organization. He might, perhaps, be said to be in charge of the why function, as it is his particular function to make each member of the organization understand, when necessary, *why* his position and his work is what it is, and thus to keep the relations between them properly adjusted.

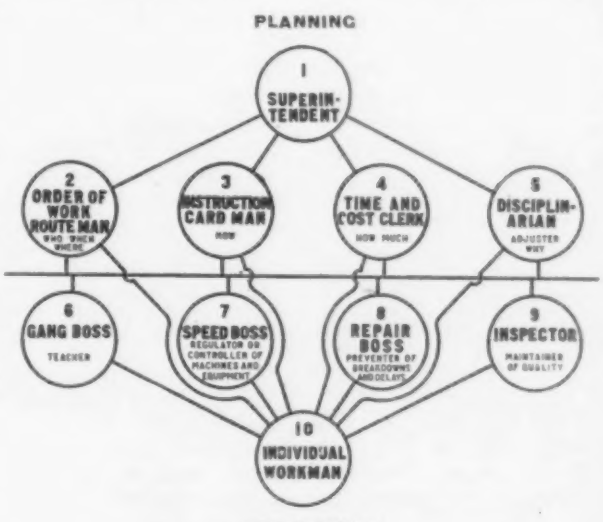



Chart of Human Organization of a Plant

As to those in the performing department, No. 6 has to do particularly with the human element, in that his function is principally that of demonstrator and teacher. Nos. 7, 8 and 9 seem, at first glance, to have more directly to do with the equipment element, as it is the duty of No. 7 to keep the machinery, if there are machines in operation, moving in accordance with predetermined speeds; the duty of No. 8 to keep all equipment in proper repair and make overhaulings at predetermined times, having the preventive ideal always most strongly in mind, and the duty of No. 9 to inspect the working conditions, processes, standards and the product. But, in the final analysis, these men, too, have a strong influence upon the human element.

Not only does the speed boss safeguard the man using the machine, but he also teaches him such work as comes within his sphere, and acts as a demonstrator of method, unit times and control. The repair boss is in the same way both directly and indirectly a teacher, giving lessons of prevention and conservation that must have an effect not only upon the man's handling of his working equipment, but of all equipment with which he comes in contact in the usual routine of his daily life. In the same way the inspector points out variations from standards, defects in the method as well as in the product, and demonstrates methods of repairing and salving of products not irreparably injured or spoiled. He also, by watching the making of the first piece and inspecting it immediately, teaches the value of forehandedness and of immediate attention to apparently insignificant details.

Finally, circle 10, the individual worker, as is shown by the chart, comes in more or less direct connection with all of the heads of functions, who are ever ready to teach and assist him and to direct his work in various ways. It will be noted that, while every individual in the organization is connected with every other individual, as the lines show, the connecting lines between the individual worker and those who direct his work are greater in number and show a more direct path than do any other series of lines.

CONSPICUOUS PLACE OF THE INDIVIDUAL WORKER

The place in the chart of the circle that represents the individual has aroused much discussion. It will take only a slight knowledge of what the measured functional type of management is trying to do to understand that the reason why there are more lines coming directly to the worker than to any one else is because he, being more untrained, needs more attention given to his development than does any other member of the organization. It would, of course, be very easy to say, "Draw the chart so that the circle representing the individual shall come at the top of the chart, instead of at the present position, at the lower part of the chart." This has been suggested by some who are extremely anxious to demonstrate the position that scientific management takes as to the importance of the individual worker.

But the placing of this circle, representing the individual in its present position, is no matter of chance, but represents a most careful desire to picture visually the relationship existing between the individual worker and the other members of the organization. The line of progression or promotion for the individual in the organization is a line that goes up, and the entire plan of management is so constructed that the pull is constantly upward. In other words, especially at the present time, when the scientific plan of management is so new, there is a call for far many more trained men to go into managing departments than are available, and the desire and tendency is that every man shall progress up along one of the various lines and into, or to assist in, one of the directing or managing functions.

Moreover, it is a part of the plan that no man can go upward fastest without having consciously trained others to take his place. This adds to the upward pushing force. Should a set of arrowheads be put on the various lines to show lines of author-

ity, sources of instruction and forces causing promotion, there would have to be such heads on every line running in each direction, for there is constant help and teaching going down from every man in the managing department to those who are managed, and at the same time the drawing power is pulling every member of the organization up into as high a position as he is able to fill. In the actual installation of measured management, this chart is shown long before any men are actually assigned to the functions, and in this way the entire plan of management is made clear to the members of the organization. It is understood that every position is open to every member of the organization who is able to fill it, and that the whole desire of those who are introducing the management is to see that the man best fitted to the position is assigned to it.

If it be possible to imagine an industrial enterprise that has simply decided upon its aim and what it is to produce and that has constructed an entirely new plant and is selecting an entirely new organization, the functional chart would then act exactly as it does in an established plant—as an outline according to which the management is to be constructed, a guide to those who are to select the men, showing how their work can best be done, and a graphical representation to candidates of the possible positions open to them.

### MEN NOT THE MACHINES OF THE FACTORY

In attempting to come, then, to some conclusions as to the relative emphasis under the scientific type of management upon the man and upon the plant, it certainly should be recognized that the larger amount of attention directed toward the men of the organization is directed toward them not because they are a part of the machinery of the establishment, but because they are the real life of the establishment; that must be properly directed in order that the result desired, both material and spiritual, shall be attained. There has been a pathetic cry from many honestly interested in the worker, who have seen the miserable outcome of various kinds of changes in industrial practice during the past, that the entire attention in this new movement shall be directed toward material things, and the human beings comprising the organization shall be let alone. This is not the place to speak of the spirit that underlies this type of management, but it must be understood before it is possible to go farther that, whatever sort of force it is, it can never demonstrate its power or its use until it affects human beings directly.

### VOCABULARY OF MODERN MANAGEMENT NOT UNDERSTOOD

The whole difficulty here is, as is the case with most difficulties, that the aim and practice of the new form of development is not understood. The plea has gone up from those whose lives are to be most strongly affected by the changes, "Explain this so that we can understand." The cry has gone up from those trying to effect the change, "Listen while we demonstrate this, that you may understand." The great barrier lies in the difference of vocabulary, a difference that neither side has been quick to understand. It is not that the men interested in this new type of management are in all cases more highly educated than are many of the men who represent the great army of workers, either as members of the working forces or as their chosen delegates. It is simply that the science of management as a collected whole is new. It has been necessary either to create new words and phrases, or to devise a new meaning for old ones, with the result that the language used very soon becomes incomprehensible to any who have not carefully studied the science of management.

Many of the workers in a plant operating under scientific management which has been installed for some time learn its methods just as intelligently as do the more highly educated members of the organization, while often men of the highest education, even of technical engineering education, who have not given much attention to the science of management, absolutely fail to understand the aims or to comprehend the ideas or motives therein expressed. This is not intended in the least as a defense for the vocabulary, nor is it claimed for a moment that there is anything about the vocabulary which could not be understood by any one. It is simply brought forward as a reason for the existing fact that scientific management has not been able to make its ideals plain to those who have neither the time nor the opportunity to devote to a close and technical study of its principles. At the present time, it remains for those who are putting the best effort of their lives into the new science to testify that it does lay a stronger emphasis on the human element and it does aim to use all forces, material and spiritual, for the development of the individual and the group over which it exercises control. The effects of this emphasis upon the individual, upon the organization and upon society are left for a later discussion.

## Expansion of New Departure Plant

A noteworthy instance of expansion of manufacture in the automobile industry is the rapid growth of the New Departure Mfg. Company, Bristol, Conn., maker of the "American Made for American Trade" New Departure ball bearings. This company is now erecting extensive additions to its ten-acre plant, and is installing machinery that will enable it to double its present production. While it is true that the European war has practically eliminated the foreign made ball bearing from the American market, and has therefore influenced to some degree this remarkable development, it is also true that permanence of increased volume of business of the company is assured by reason of the fact that this home-made ball bearing has proved itself equal to the best of the foreign product. The conservative management of the company would hardly expend extraordinary sums for temporary use. Furthermore, the company is not making war materials. The doubling of its capacity is due to large contracts secured before the war influence was felt in this country, with the realization on the part of the American ball bearing user that he can secure at home as good a product, and in some instances better, than he has been buying abroad. With its enlarged plant the company will, in a few months, have facilities for meeting any American demand satisfactorily.

In process of construction is what the company believes will be the largest building specially designed and equipped for grinding purposes in the world. The machinery to be installed will be of the latest type, most of it specially designed by the company's engineers, who have specialized on ball bearing quality as well as on quantity production. Another important extension will be that of the largest of its heat-treating buildings. This building, when completed, will contain 230 oil fired furnaces, specially designed by the company's experts. Supplementary to the furnaces themselves will be a new arrangement of the quenching vats and the operation of a liquified ammonia gas refrigerating system, which will greatly increase the amount of work per furnace, and hold the processing of the steel to practically perfect uniform quality. This mammoth heat-treating building will probably also be the largest employed in the manufacture of anti-friction bearings. Other departments will be increased correspondingly.

The Corrugated Nib is Formed by Punches and Dies from the Cold Bar as it is Fed Through the Machine from Right to Left. The four operations indicated by number are done simultaneously, as is also the cutting off of each completed calk along the dotted line

# The Manufacture of a Toe Calk for Horse Shoes

## An Automatic Machine to Convert Steel Bars by a Cold Process into Finished Toe Calks Without Waste of Material

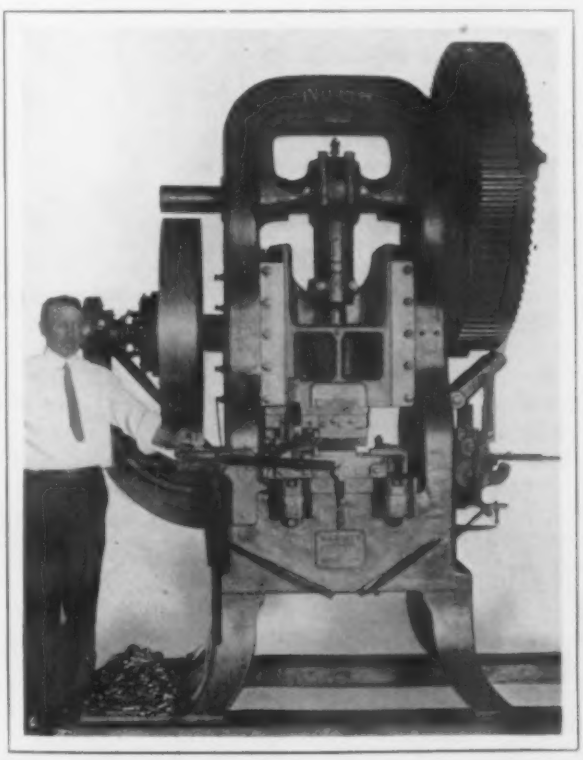
The photograph reproduced at the top of this page illustrates a new form of toe calk for horse shoes. The nib which is driven into the shoe is corrugated to improve its holding quality and it is formed by a cold swaging process which is calculated to make it unusually tough. The calk is made from a bar of steel of plain rectangular section, and the formation of the nib and cutting off to desired length are performed in one pass through the machine shown in the cut at the bottom of the page.

The calk is known as the William J. Kent toe calk and is manufactured by the Corrugated Nib Toe Calk Company, Brooklyn, N. Y. The machines for the production of the calk were designed and built by the V & O Press Company, Glendale, Long Island, N. Y. The basis of the machine is a V & O No. 64 geared press of the straight sided type, with a special friction clutch having an automatic trip and a self-acting brake. The press is equipped with an automatic ratchet-driven roll feed and a series of five punches and dies which have a gage connecting with the automatic trip on the clutch. The calks illustrated are ¾ x ½ x 3 in. long, but as various sizes are used the machine and dies are adjustable.

In operation, the bar is passed into the roll feed shown at the right side of the press. This feed has an intermittent motion, allowing the bar to dwell during half of each revolution of the press and giving time for the action of the punches and dies. The dies are of the progressive type and the bar first remains under a breaking down punch which performs the first step in swaging the nib, shown in section 1 of the picture of the bar. At the next revolution of the press the feed advances the bar with the partly formed nib to the position under the second punch, which further compresses and thus elongates the nib, No. 2; meanwhile the part of the bar which has just come within the machine receives the breaking down or No. 1 punch.

At this point the bar advances two steps before reaching the third die which contains the pointing or shaping mechanism. This step, No. 3, in forming the nib is performed by a hinged jaw moved by a cam operated by the press slide. The fourth step is for sizing and corrugating and is the last operation in the formation of the nib, or No. 4. The bar is then advanced to the fifth position, where it is cut off to length. It will be understood that all of these operations are performed simultaneously, so that after the bar has advanced to the fifth die, then each successive stroke or revolution of the press produces one complete calk; also each new bar is butted against the preceding one, which allows continuous operation of the press.

Mention has been made of a gage in the dies connecting with the trip mechanism of the clutch. It will readily be understood that in advancing the bar step by step, absolute uniformity of feed is required, otherwise the descending punches would not register with the nibs, resulting in imperfect work or, if badly out of alignment, in broken punches and dies. The gage is located between punches No. 1 and No. 2 and consists of a pivoted finger with one end projecting into the path of the nib formed on the bar under punch No. 1; the other end connects with the trip mechanism on the clutch. If the roll feed does not advance the bar the exact distance required the rear end of the gage finger engages a latch and the downward motion of the press slide operates the trip, thus disengaging the clutch. This in turn releases the self-acting brake and the press is stopped before the punches strike the bar. Any disturbance sufficient to prevent the bar from taking proper position will cause the press to stop and will indicate to the operator that adjustment of the press or bar is necessary.



The Bar Enters the Machine at the Right and the Completed Calks are on the Floor at the Left

As the crushing strain in this cold swaging process is very high, high-grade tool steel had to be used for the punches and dies and it has been found advantageous to play a stream of cutting compound on the first or breaking down punch. This serves the double purpose of cooling the tools and washing away any loose scale.

The two methods of manufacturing toe calks heretofore in general use are: 1, forging the nib from a heated bar; and 2, cutting the nib from a bar of special section.

# Machining High-Explosive Shells

## The Operations, Particularly in Making from the Solid Bar—Lasting Influence on Production Methods Being Exerted by the Specialization

BY C. A. TUPPER*

Contracts for shrapnel to be manufactured in this country have been very largely closed for the present, with deliveries extending over a period of two years; but a very considerable demand exists for high-explosive shells, and is particularly urgent for the 6-in. and 155-mm. sizes, which closely correspond. Thus far the bulk of the orders placed has been for 75-mm. (2.95-in.) shells or their equivalent, and, from the vast quantities of that calibre called for on the European battlefields, this condition will probably continue to rule throughout the war.

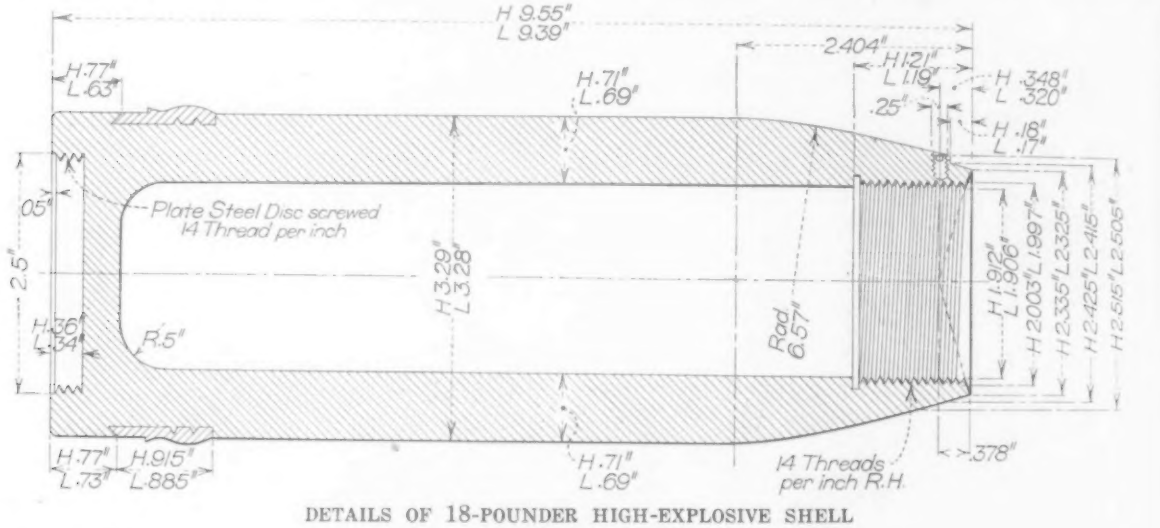
### 100 SHELLS PER HOUR AS MANUFACTURING OUTPUT

With the principal contracts only a few concerns in this country or Canada have anything to do. Sub-contracts are usually based on a minimum of 1,000,000 shells, although this may in turn be divided among a number of co-operating shops. To insure the delivery of that quantity in the two years normally covered by the contract, with due allowances for delays, rejections and other contingencies, means a production based on 100 shells per hour and that is now being generally taken as the unit in providing for layouts of equipment.

The manufacture of high-explosive shells naturally falls into two distinct but converging lines, embracing projectiles made (1) from forgings and (2) directly from rolled bar stock. The former are represented principally by British orders and the second more largely by French and Russian with some British. This article will take up briefly the machining of forged shells and in more detail the production of those made from bar stock.

The British 15-lb. shell, which was originally the most used, has a calibre of 3 in. This, however, has been to a large extent superseded by the British 18-lb. shell. The body of one of these shells, as illustrated herewith, has a length of 9.55/9.39 in. (expressed as the maximum and minimum allowable) and the diameter may vary 0.005 either way from 3.285 in. These and other dimensions given are proportionately approximated in shells of other sizes.

In part the machining operations are practically identical with those described in THE IRON AGE of Sept. 9, for the manufacture of shrapnel and need no repetition. These include cutting off and trimming the open end of the forging, facing off the base, roughing and finishing the exterior, cutting the band seat, undercutting it and waving. Nosing and pressing on the band are also accomplished in the same manner as for shrapnel. Boring, however, is a much more simple operation, as there is no powder cup or diaphragm seat to be provided for. The interior is straight bored to a diameter below the throat of 1.912/1.906 in., and the throat is threaded to 1.997/2.003 in. This throat, it will be observed, is deeper than the socket of a shrapnel case, previously illustrated, and is made to receive a head or fuse base similar to one which will be described below for a 75-mm. French shell made from bar stock.




DETAILS OF 18-POUNDER HIGH-EXPLOSIVE SHELL

| | |
|---|---|
| Diameter of body in. | 3.285 + or — 0.005 |
| Length of shell | 2.87 calibers |
| Radius of head | 2 calibers |
| Diameter over driving band, in. | 3.3875 + or — 0.0025 |
| Estimated weights: | |
| Empty body | 14 lb. 7½ oz. |
| Driving band | 4¾ oz. |
| Estimated weights (continued): | |
| Total, empty, unpainted | 14 lb. 12¼ oz. |
| Paint | ¼ oz. |
| Bursting charge | 14 oz. |
| Fuse and nose piece | 2 lb. 13½ oz. |
| Total, filled | 18 lb. 8 oz. |

### DIFFERENCE BETWEEN SHRAPNEL AND EXPLOSIVE SHELLS

The most important distinctions from shrapnel shells lie in the thickness of the side walls, 0.69/0.71 in., and the recessing and plugging of the base. A fixing screw may also be used for the head as shown.

In the manufacture of a high-explosive shell, no chances are taken with a possible pipe or other defect in the base which might be overlooked in inspection, as any seepage through of fume-laden air between the bursting and the driving charge

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might cause an explosion of the shell in the gun. Hence the base is recessed to a depth of 0.34/0.36, with 2.5 in. diameter, and threaded for the reception of a cross-grained steel plate plug, and the edges are riveted or welded together after being coated with Pettman cement or its equivalent. On a special machine for the purpose, the base can be recessed and threaded in 2½ to 3 min., although with ordinary equipment it takes considerably longer.

Other details of contour and dimensions are shown clearly by the drawing. The maximum and minimum gaging allowed are signified by the letters *H* and *L*, which stand for high and low.

### SPECIFICATIONS FOR SHELLS FROM THE SOLID BAR

The above has been passed over briefly for the reason that interest at present centers chiefly in shells machined from solid bar stock. For a French or Russian 75-mm. shell, which represents the predominant size, this is delivered from the mills in rolled bars having a diameter within 1 mm. of 82 mm., "calibrated and dressed from the dead round," as the French specifications express it. Steel for the purpose is also required merely by the same specifications "to have the chemical and physical qualities of ordinary high grade open-hearth or Bessemer steel, with carbon 0.40 to 0.50; tensile strength 80,000 to 90,000 lb.; elongation 8 per cent in 2 in." The same applies to the forged nose piece to be described later. In practice, selections of stock are along the lines already quoted in THE IRON AGE and there is a great deal of elasticity. A tendency has been observed of late to crowd up the limits for tensile strength, but the principal reliance is still placed in the heat treatment.

Measurements following will be expressed in the contract term of millimeters, as to attempt to give their equivalents in inches would be confusing and futile. The language of the specifications will also be adhered to as far as possible, although the French conception of English technical terms has sometimes led to ludicrous misunderstandings.

The total length of the 75-mm. diameter shell without the fuse base or head, is 265 mm., making it 234 mm. for the shell body and 31 mm. above the shoulder. From the base to the enlargement is 162 mm., and the diameter at this point should be 74.4, with an allowance either way in practice of 0.1 mm. From the enlargement to the driving band, the diameter is 74 mm., with 0.2 mm. "tolerance." Below the driving band the shell is 74.4 mm. in diameter, corresponding to that of the enlargement, which centers the shell in the gun. Interior dimensions will be given under the various machining operations.

The thickness of the base is 13 mm., with 0.4 allowance for oversize but *none* for undersize. Only a slight overrun in the cut at this point, either side, will cause the shell body to be scrapped. Sidewall thickness ranges from 8.5 mm. in the upper part of the central cavity to 10.5 mm. in the middle, and these dimensions are also absolute. Any excess in the metal removed is fatal to the work.

### THE ROUGHING MACHINING OPERATIONS

For the preliminary hollowing out, or rough drilling, the bar is centered and then secured by the uncentered end on a drill press or chucked in a lathe, and drilled 46 mm. in diameter to depth, which is 220 mm. or a trifle more for this first cut. The operation takes 6 to 8 min. A 0.024-in. feed will give satisfactory results. If a drill press is used, an alternative to the usual practice is to fix the drill in a holder on the table and the shell body in a chuck attached to the drill spindle, thus facilitating the ejection of the drillings.

For roughing the exterior, the shell can be most easily and securely held by an expanding mandrel chuck, and the operation is a simple one of turning, using former and dead center. From 5 to 7 min. are required, depending on the type of lathe used, arrangement of tool parts, etc. With a single purpose machine and multiple tools, the time can be reduced to 4 or 5 min., using a cutting speed of 0.047. Parenthetically, it may be noted here to advantage that a line of single purpose tools, so grouped as to give a definite unit of production for each operation, will effect the greatest aggregate saving of time and labor and where a shop is equipped new, this feature should be taken into account.

To rough bore the interior the piece is secured in a jaw or collet chuck and against the live center. After this comes a complicated operation of reaming and shoulder chamfering, at various depths, with a string of gang tools and fine hand feeds. The first operation, with 0.030-in. feed, takes about 4 min.; but the finishing cuts at 0.047 to 0.050 in. can hardly be effected in less than double that time. Unlike the British shell above described, the cylindrical interior of this French shell has three principal diameters, with corresponding chamfers at 45 deg., which eliminates the possibility of straight boring. Allowing for a radius of 10 mm. between the interior of the shell cylinder and the base, the diameter of the cavity is 50 mm. at the bottom, 53 mm. for the middle section and 57 mm. for the upper one, enlarging to 61.3 mm. at the bottom of the throat. The lengths of these sections are 50 mm., 30 mm. and 112.5 mm., respectively; which, allowing 13 mm. for the base and 28.5 mm. for the threaded throat, makes up the 234 mm. of shell body length. Diametral allowances of 0.2 mm. and longitudinal allowances of 1.0 are made for each of these sections.

### THE FINISH MACHINING OPERATIONS

A finishing cut for the entire exterior is taken by securing the piece in a lathe and feeding say 0.031 in. This is plain turning, and by the use of multiple tools the smaller diameter, enlargment and rough contour of the nose can be taken care of at one setting. The nose of this shell body is not made by heating and forming in a press, as for shrapnel, but is entirely machine cut from the open end of the hollowed bar.

With chucking the same as that for the finishing cut on the body, the seat for the driving band is roughed out and undercut and the waving cut taken, the two last named usually being combined. The width of the groove is specified as 12.2 mm., but a variation of 0.2 mm. either way is permitted, precaution merely being taken afterwards to see that the band fits snugly. The lower edge of the band groove is located 43 mm. above the shell base. From this point to the center line of the generating arc for the "nose piece" or fuse base is 160 mm., and that measurement is taken as a guide in getting the right contour for the latter. In cutting the band seat and waving—operations which were outlined in THE IRON AGE, Sept. 9, the time required is about 3 min. With special equipment it can be done in less.

### THE HEAT TREATMENT

The annealing, which should take place before the threaded parts are finished, can be done in any standard furnace for that purpose, as previously outlined on the subject of shrapnel, and takes about

twenty minutes at a heat of 825 to 850 deg. C., the last named being the maximum of safety. Each shell body is then cooled in hot ashes or other material which will insure a gradual reduction of the temperature.

Tempering takes place at 750 deg. C. heat and cooling in any approved manner, commonly by plunging in a bath of water which is kept running and maintained at 18 deg. C. or by simultaneously splashing with a copious stream of water both inside and out. These methods are recommended by the French authorities.

It is specified that, before tempering, the body of the shell must be brought to at least approximate dimensions and that these shall be absolute for the interior surfaces, for the sections of the base and for the exterior of the body from the driving band to the enlargement. This is to prevent any distortion which would not be subsequently corrected. Furthermore, those responsible for munitions contracts take occasion to impress on shell manufacturers the need of even, gradual heating of shell bodies throughout their molecular structure and the maintenance of uniform temperatures in every part of the working furnace area. All of these precautions, however, are merely a matter of common sense and ordinary good practice in the production of high grade steel parts, such as automobile axles.

After tempering, the shell body is reannealed in a muffle furnace at 525 deg. C. for a period of 25 to 30 min. and again cooled slowly. Foreign practice has been to reanneal by immersion in a bath of molten tin, but care must be taken in this case that the bath is free from any trace of lead, which would afterward tend to make the picrate explosive an unstable compound, if even a minute quantity should cling to the interior surface. To a layman the possibility of this seems rather far-fetched, but the caution is regarded seriously enough to be mentioned in contracts.

### THE THREADING OPERATIONS

After tempering, the threading of various parts is next in order. Cutting, or more appropriately milling, the thread in the throat of the shell is an operation requiring extreme accuracy and, while it can be accomplished with any standard machine for such work, is best done on one especially adapted to the purpose. With a tool evolved from early Canadian practice in the manufacture of shells, which will be cited here as an example, the shell is secured in a hollow revolving spindle and self-centered. An automatic stop brings the machine to a standstill when the thread is completed. The cutter is designed to mill the top of the thread, as well as depth, and it is so shaped that it can be put in condition for reuse without changing the form. High speed steel should be utilized for this and most of the operations previously described. The above method, or the use of collapsible taps with ordinary thread cutters, is also a safeguard against having shells rejected on account of stripping or gouging. The thread in the throat has a diameter of 61.5 mm. at the top and 59 mm. at the bottom, with height of 28.5 mm. A *square* thread, 2.5 mm. pitch, right-hand screw, is used.

Threading the recess in the base is accomplished in a manner similar to that given above for the British 3.29-in. shell, and the other machining operations for that part are also practically identical, hence have not been repeated. The plug, which is a forging, may come as a separate article of manufacture or be produced in the same shop on a bolt-making or other small forging machine, or with a hammer, drop-forge or other suitable arrangement. The die heads used in threading are preferably of the automatic opening type. Plugs, however, are most economically produced in some shop as a specialty and supplied in quantities to shell makers.

### THE RIFLING BAND

The driving band for the rifling movement of the shell, when fired, is formed from rolled copper tubing to a width of 12.1, with 4.3 mm. thickness and 71.2 mm. inside circumference, corresponding to the diameter of the shell and the exact dimensions of the band seat. Any variation of these will naturally affect the band accordingly. This strip, expanded at red heat, is forced into the groove and waved recesses by means of a banding press, as described in the article on shrapnel in the issue of Sept. 9. Originally these bands were secured by hand or pneumatic hammer caulking with loose rings, the same as the bases of steam turbine blading are still caulked and until recently some French shops have followed that method. For cutting the copper bands in annular strips from tubing of the right diameter and gage, suitable machines have been devised, and this is becoming another specialized branch of shell production. It applies, of course, quite as much to shrapnel as to high explosive projectiles.

Turning the band is an operation which can be performed on any light speed lathe, with fine hand feeds; but there is more difficulty with this than with any other part of the work, and it takes a man especially skilled in it to avoid a high percentage of rejections. Exactness is required and rigidly adhered to by the inspectors. The complete operation takes about 2 min.

Trimming, facing and chamfering the base may take place at almost any stage of the machine work. To do what is required, with a cut-off machine or lathe having suitable tool attachments, takes about 3 min. The chamfered radius of the base extends 1 mm. in from the edge and 6 mm. in height.

### THE NOSE PIECE

The work on the shell head or fuse base, or nose piece (*gaine*) as the French specifications describe it in English, demands first of all the "faultless execution of all threads," the lower of which must be matched with the thread of the body of the shell and the upper with the detonating cap or fuse. Machining of the surfaces, facing the ends and chamfering the edges where the threads engage are all simple operations. The entire work can be best performed with automatic tools, such as are commonly used for similar small work, and several machines embodying the necessary features can be tended by one operative. As the shell head is made from a pressed or drop forging, its manufacture may take place in a special shop quite distinct from the machining of the shell body from bar stock; hence, in assembling, the authorities need to insure themselves of having lots which match so well that the mating threads have the least possible play. This will explain at least one good and sufficient reason for inspection which at times has been thought unnecessarily rigid.

On the outside of the nose piece two notches are made to permit screwing this into place in the body of the shell by means of a key, avoiding any use of the screw in the top opening or port which receives the cap. The contour of the nose piece, the arc for generating which measures 111.25 mm., is verified on the assembled shell by means of a simple gage applied on the enlargement and "on the flat part of the nose piece." Shells are deliv-

ered with the nose piece screwed in lightly, as so to enable them to be taken apart easily for loading.

Interior details of the nose piece are as follows: The part of the top opening or port to be threaded is bored to 33.8 mm. and enlarged to a diameter of 36.1 mm. at the bottom of the thread, which has 2-mm. pitch. From the tip of the nose piece to the bottom side of what the specifications describe as the "trench" opening from the conical interior is 14 mm., and the trench diameter and height at the bottom are 38.3 and 2 mm., respectively. The diameter of the small cylindrical part of the port is 28 mm. and its height 5 mm.

For the conical interior finished measurements must show a height of 40 mm., large diameter 54 mm., small diameter 42 mm. and radius of 6 mm. for the round section.

This part can be made complete on automatic multi-spindle chucking machines, with an average time for each piece of 1½ to 2 min. As finished, the height of the nose piece measures 59 mm., and of this the threaded section screwing into the throat of the shell body measures 28 mm., leaving 31 mm. above the shoulder of the latter. Its diameter at the top is 47.5 mm. An oak plug, threaded like the fuse cap, is made to screw into the port for protection to the thread during shipment.

### MARKING COMPLETED SHELLS

Each shell, upon completion, is stamped parallel with its axis on the cylindrical surface above the belt, indicating that it has been bored from the solid from Lot. No. — of (Name of steel mill) and has been tempered and tested to a pressure of 400 kg. The nature of this test was indicated by the United States Army requirements recently printed in THE IRON AGE. After being painted, as described for shrapnel, the shells are greased with the exception of the belt and packed for shipment in accordance with the Interstate Commerce Commission's regulations. Contracts also specify "delivery in handy cases, having marked on the outside the name of the maker and arranged inside to avoid the contact of the shells during transport; for example, in strong covered cases each containing ten shells." Loading and screwing in the fuse cap is done at destination.

### THE ADHERENCE TO SPECIFICATIONS

As compared with the manufacture of shells for the British Government, the production of high-explosive shells for French account seems to be more generally satisfactory to American makers. This is owing to a disposition on the part of French munitions officials not to insist upon unessential points, but to make every possible allowance or "tolerance" which will not actually affect the quality and usefulness of the shell. The principal points at which absolute dimensions are insisted upon have been indicated above. Others which were required earlier have been subject to modifications in the interest of economical, rapid production.

Only on the subject of tempering is there uncompromising rigidity. In this respect the early French specifications stated that "a manufacturer who should supply shells that show defect in temper would have his contract cancelled." So far as the writer is aware, however, no relations have thus far been arbitrarily terminated on any such basis, and where controversies have arisen adjustments have been made possible. Naturally, in developing an entirely new line of production, manufacturers in this country have made numerous mistakes; but any case of an attempt to "put one over" on the foreign purchaser of shells has yet to be uncovered, and the sub-contractors have in every case shown a disposition to learn the right methods.

The most serious complaint has probably arisen from the failure of some concerns actually to begin the manufacture of high explosive shells at the dates specified in their contracts, or rather to make deliveries in certain quantities at the dates agreed upon. For this inability to secure necessary equipment has been principally responsible. Gradually, however, all of these details are being worked out and the contracts so divided that a very satisfactory general level of production can be maintained.

### INFLUENCE OF MUNITIONS MAKING ON GENERAL OPERATIONS

In many cases only emergency equipment has been provided, or hastily "thrown together," and entirely new machine layouts, based on specialized unit production, are being planned. When these installations are completed, it will be possible not only to reduce materially the average time of each single operation but also to eliminate delays in handling and resetting. Furthermore, the use of only moderately skilled labor, with a few highly trained men and thoroughly competent foreman, is made possible under the new system being evolved. In general it follows the lines made familiar in automobile plants, and men who developed such plants have been turned to, to lead the way again in the emergency. As the companies now engaged in shell making have had an extremely varied line of products, and few have heretofore come under the stimulus of specialization such as the makers of motor vehicles and parts are now accustomed to, the new systems adopted cannot fail to have an extremely beneficial and lasting effect upon their future operations in standard lines of manufacture. With this in view, the production of war munitions takes on a degree of importance which divests it of any merely transitory character and lifts it on to a plane with the great industrial movements of the age.

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## Metals Used in Making Shells

The metals needed to execute the war orders already placed are estimated at over 10 per cent of the 1914 copper production of the United States, about 7 per cent of the spelter output and nearly 20 per cent of the lead production, by the London *Iron and Coal Trades Review* of Sept. 17. A British 18-pounder, or 3.3-in. shrapnel, requires 5 lb. 9⅛ oz. of brass containing 66 to 70 per cent copper or nearly 3¾ lb. A small copper band around the shell adds 4¾ oz., making the total copper 4.04 lb. Spelter consumption for a shell of this size is about 1.87 lb. Lead bullets weighing 7.92 lb. and composed of 7 parts lead to 1 part antimony, constitute the metal load of the projectile. Estimating the total orders for shrapnel and other shells placed in the United States by Europe at 25,000,000 they would call for a total of 101,000,000 lb. of copper, 46,750,000 lb. of spelter and 173,250,000 lb. of lead. Actually the metal consumption is larger, as a fair proportion of the shells are 4.7-in. howitzer shells using more brass; some 6-in., 7½-in., and probably 9-in. shells are also being made. Rifle cartridges are made of copper mainly, 1 lb. of it being used in making 24 Lebel cartridges, a type widely used by the French army. Every 125 of these take 1 lb. of spelter and a small amount of nickel.

Steel consumption per shell varies widely in different types. A finished 3.3-in. shell contains 6 lb. 15¼ oz. of steel, the shell weighing 6 lb. 5¾ oz. and the diaphragm 9½ oz. If the shell is made from a steel bar, the weight is about 17 lb., while a forging for the same purpose weighs approximately 14½ lb. and a bottle made by the seamless tube process somewhat less.

## Single-Purpose Lathe for Shell Work

Two single-purpose lathes have been placed on the market by the Cincinnati Iron & Steel Company, Cincinnati, Ohio. These lathes, which were designed by S. W. Sparks, Cleveland, are intended for shell, automobile and various types of single-purpose work. Two sizes of the lathe are built, one for shells up to 6 in. in diameter and the other for shells ranging from 8 to 12 in. A special four-bar turret has been adopted.

The lathes are of the geared-head single-pulley drive type, and four speed changes are provided. The gear box on the smaller machine provides five feed changes ranging from 0.02 to 0.1 in. per revolution of the spindle while on the larger machine there are six changes ranging from 0.03125 to 0.375 in. The transmission from the spindle to the feed box is by silent chain and a dog tooth clutch for stopping the carriage automatically is inclosed in the feed box together with a reverse feed.

The carriage is equipped with a heavy plain rest and a four-post tool holder. Cross feed is provided for the slide and there is an automatic longitudinal stop for the carriage. The apron is of the shrouded box type with a double support for each stud and gear. All of the gears in the apron are of steel with the exception of the worm gear which is made of manganese bronze. The drive to the gears in the apron is from a hardened steel worm on the feed shaft, the ratio of the gear reduction in the apron in the larger lathe being 80 to 1.

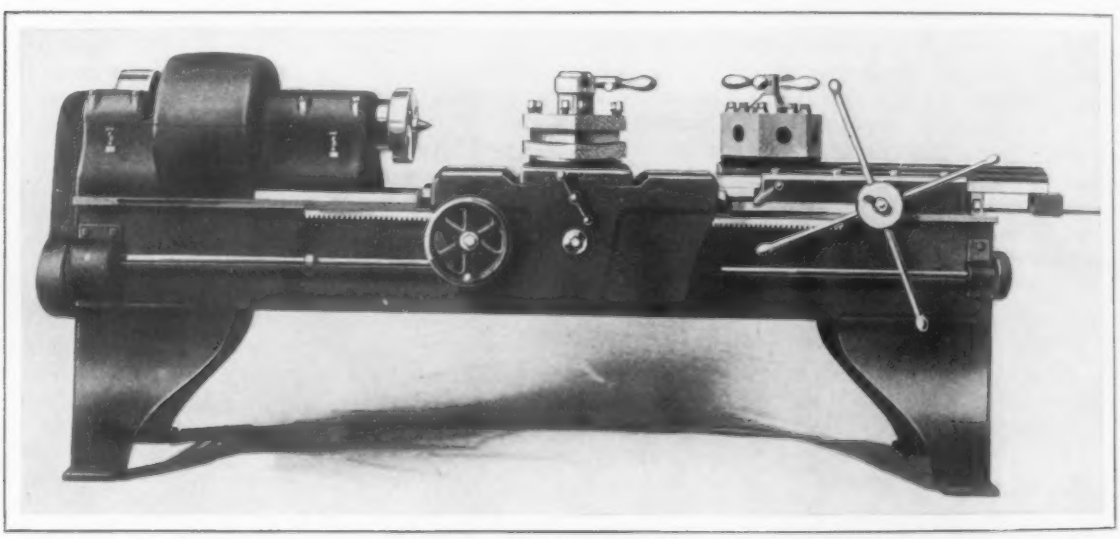
The tailstock is of the offset type, and is of heavy construction. In the larger lathe it is reinforced by ribbing and has three clamping bolts operated by a one-piece clamp that operates the full length of the tailstock bearing on the carriage. The spindle of the tailstock in the larger machine has a double thread on the screw for quick traverse.

The carriage turret, which is of the four-bar type, is of heavy all steel construction and is especially designed for shell work. It has been substituted for the customary hexagonal type that is mounted on the cross slide and is intended to carry four 2-in. bars. If the work to be done on the lathe includes the forming of the interior of the shell, a standard forming attachment can be supplied. This attachment has a bar which is connected to the four-turret tool post or the plain rest. In connection with this attachment there is an adjusting rod extending through the back of the machine on which a hardened tool steel roller that engages with a slotted cam on the rear of the machine is fitted. The attachment can be used on both sides of the plain rest or turret tool post. A device on the side of the tool post having a screw adjustment is provided to enable the tool or depth of cut to be varied while the lathe is being used in connection with the forming attachment. Included with the attachment are the brackets and base plate on which the slotted cam is fitted but not the cam itself. These cams, which are different for the various kinds of shells that have to be turned, are ordinarily furnished by the purchaser, but, if desired, can be supplied by the builder. The cams are of hardened and ground tool steel, ⅝ in. thick and are the entire length of the shell, an arrangement which permits the operator to turn the entire body or the shell and to continue on and form the nose with the same cut.

A four-turret tool post with a lug cast on both sides is provided, to receive the adjustable bar of the forming attachment. When the feed of the forming attachment is being used, it is necessary to disengage the nut of the tool post and for that purpose a split nut device under the base of the turret slide is provided which is drawn together and opened by a handle on the top of turret base in front of the tool post. This arrangement is practically the same as that used on a standard engine lathe when screw threads are being cut.

The waving attachment supplied is of standard construction and is operated by a spring and hardened steel roller, working from the face of a cam fitted on the face plate attached to the nose of the headstock spindle. This attachment, which uses an inverted tool and is operated by hand feed screw in conjunction with the turret tool post on the carriage, is used as a back rest. Provision is made for adjusting the tool over the full width of the top slide of the waving attachment, which is 11 in. After the operator has finished using the waving attachment, the split nut is disengaged and the attachment pushed out of the way by hand. The use of this attachment in connection with the four-turret tool post and the forming attachment enables all of the outside operations on the shell to be completed with one setting.

The taper attachment is practically the same as the forming attachment except that a bar with a straight slot extending from one end to the other



A Single-Purpose Lathe for Shell and Automobile Work Equipped with a Special Four-Sided Turret

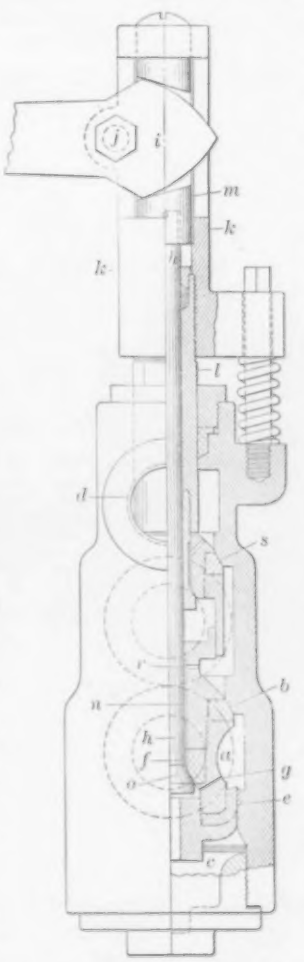
is substituted for the slotted cam fitted to the bracket at the back of the machine. This bar has a fixed center on one end and is adjustable on the other to enable the operator to adjust and obtain any desired taper with the graduations on the back.

The equipment that is not regularly included with both lathes includes the forming, waving and taper attachments, the four-turret tool post and the carriage turret. Hand and power feed turrets on the shears can be supplied at extra cost for the smaller lathe and a heavy power feed bed turret with independent stops for each face of the turret in the case of the larger lathe.

## Hydraulic Rolling Mill Operating Valve

For operating heavy pressure hydraulic machines, such as are found in rolling mills, the Diamond Machine Company, Monongahela, Pa., has placed on the market the Bowes hydraulic operating valve. It employs fiber packing to secure freedom from leakage and special emphasis is placed on its easy operation.

The body of the valve is of solid bronze. There are three pipe connections for the valves, one connecting with the pump supplying the pressure, the second connecting with the cylinder to be operated, while the upper one carries away the water that has been used. The admission and discharge of water are controlled by two brass stems mounted one inside the other. The seats are solid rings cast integral with the body of the valve and cut on an angle of 60 deg. Fiber disks beveled to correspond are seated on these rings and are inclosed on three sides by brass.




A 1½-In. Three-Way Hydraulic Operating Valve for Rolling Mill Machinery

In operation the water from the pump enters the space *a* and passes through the hole *g* into the space *c*, subjecting the parts inclosing the disk *b* to pressure which is also applied to the bottom of the stem *h*. As the fiber disks *b* and *f* yield slightly, a tight joint due to the pressure upon them is secured. The exhaust *d* is equipped in the same way with a fiber disk *s*, also seating on its beveled ring. The use of fiber tends to eliminate the injuries that would be produced if grit or scale came in contact with the metallic seats. The two stems controlling the admission and discharge of the water are actuated by a cam, *i*, working on a pivot, *j*, that is screwed into the head *k*. The outlet stem *l* is also screwed into the head *k* and moves up and down with it. The hardened steel sliding bolt *m* is cut away to form a bearing surface for the cam.

Movement of the operating handle, like a pump, causes the bolt *m* to slide up and down in *k*. The stem *h* screws into the bolt *m* and has a working fit in the outlet stem *l*. It passes down through the space *n* and terminates in the enlargement *o* or pilot valve, which seats on the beveled fiber ring *f*. This stem has an unimpeded downward movement of approximately 1/16 in. before coming in contact with the end of the plug holding the cup leather in place.

When it is desired to admit water, the entire lower assemblage of parts which is designated as the plunger, must be forced downward. The pressure on the entire area of the fiber ring *b* is too great to be overcome directly. By raising the handle of the cam *i*, the pivot *j* is pulled up, this action bringing the outlet disk *s* home on its seat. The bolt *m* passes downward at this time and carries the stem *h* with it. In the meantime the water in the space *a* has found its way into *c* through the hole *g*. As soon as the cam pressure forces the pilot valve *o* from its seat against the hydrostatic pressure of the pump, the water rushes through the space *n* and out of the holes *r*, thus relieving the pressure in *c*. The only service expected of the cup leather *e* is to stop the attempted rush of water from *a* to *c* while the stem is moving downward. The space *n* around the stem permits the water to escape freely, thus relieving the pressure in the space *c* and on the bottom of the plunger. This arrangement, it is emphasized, makes the operation of a large-sized valve under high pressure with a very short lever comparatively easy. The opening from the space *c* is much larger in diameter than the small one *g* into it so that the pressure to be overcome is only a slight one.

After the plunger had been down into the space *c*, the suction of the cup leather would tend to retard its coming back. For this reason the small hole *g* is provided to allow water to flow into *c* as the plunger is raised in the act of closing. When the valve is closed the pressure on the bottom of the pilot valve *o* forces it against the seat and pressure against the bottom of the plunger forces the fiber disk *b* against its seat. In this way, it is emphasized, the water passes through a large passageway without destructive action on the valve. A similar pilot valve is provided for the outlet to make the discharge easy. When it is desired to open the inlet the cam pulls upon the outlet, closing the fiber disk *s* against its seat. The pilot valve is then forced from its seat and the main valve is forced off its seat immediately afterward. When the handle is returned to the middle position the water supply is cut off, while by depressing the handle the fiber disk *s* is forced off its seat and the water discharged.

## War Demand for Horse Shoes

Late Government statistics indicate the scale of the war demand for horse shoes. Our exports in June, 1915, were 750 per cent greater than in June, 1914, or 6,621,671 lb. against 86,883 lb. For the fiscal year ended June 30, 1915, the exports were 29,157,243 lb. against 2,723,806 lb. and 2,594,448 lb. in the fiscal years of 1914 and 1913 respectively.

The Norman B. Livermore Company, Merchants' National Bank Building, San Francisco, has taken the agency for the full line of logging equipment made by the Lidgerwood Mfg. Company. T. L. Williams, lately with the Seattle office of the Lidgerwood Company, and C. A. Bechtold, engineer of the same company, are now with the Livermore Company. It has also taken the agency for Knox tractors, made at Springfield, Mass.

# A Modern Foundry Pig-Iron Mixer

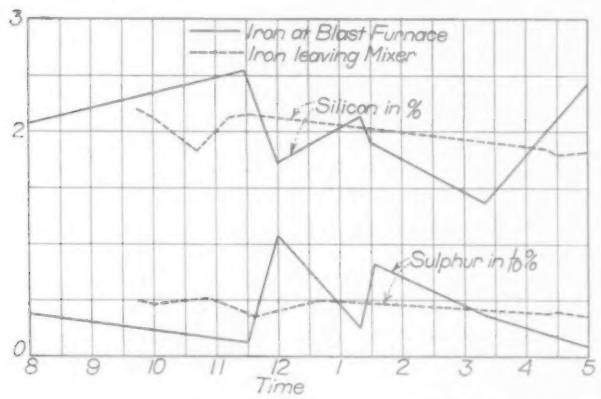
## Its Use in a German Iron Foundry—Operating and Chemical Results with Blast-Furnace and Coke-Oven Gases

An interesting article by Prof. O. Simmersbach on the construction and operation of a modern pig-iron mixer for foundry use appears in a recent issue of *Stahl und Eisen*. This mixer is at the Friedrich Wilhelms Hütte at Mühlheim on the Rühr, which is a very modern plant, and concerning which several articles have appeared in THE IRON AGE, on the economic uses of blast-furnace and coke-oven gas in that plant.

### CONSTRUCTION OF THE MIXER

The mixer is of the flat hearth type, and the measurements of the bath are: Length, 38 ft. 8¾ in.; width, 12 ft. 5½ in., and depth, 3 ft. 11¼ in. The capacity is 150 tons. The depth is purposely kept low so that the metal can be readily heated and mixed. It is of the tilting type, being laid on rockers, and is electrically operated. If necessary it can be tilted by hand.

The port ends are movable, and have water-cooled rings at the contact surfaces. Before being




Results with the Use of a Pig-Iron Mixer in an Iron Foundry

moved back from the furnace they may be slightly raised, which prevents the brick work being broken at the lower contact surface. There are two slag pockets, each 31.5 in. wide, and the usual regenerators for gas and air, which are 26 ft. 3 in. long, 16 ft. 4¾ in. to the spring of the arch, and 5 ft. 11 in. wide for the gas, 8 ft. 10¼ in. wide for the air. There are six openings on each side, and one at the back, so that the greatest accessibility is assured when repairs are necessary.

The incoming and outgoing pouring spouts are on opposite sides of the mixer, and there are two of the former, one near each end. The mixer has an acid, not a basic lining, so as to leave the silicon of the iron unchanged. There is naturally no desulphurization, but as shown by the following results, considerable equalization between high and low sulphur iron takes place.

### FOUR OPERATING TESTS

Four tests were made, the first two while the mixer was heated with mixed blast-furnace and coke-oven gas, and the second two when blast-furnace gas alone was used.

*First Test, Using the Two Gases.*—The mixture of the two gases was so arranged that the heating value was about 130 B.t.u. per cu. ft. The effect of heating in the regenerator did not greatly change the composition. The regenerator temperatures change according to the gas composition, which was varied according to the temperature and kind of iron entering the mixer. The test lasted seven and three-quarter hours, and the average temperature in the air regenerator was 931 deg. C., in the gas regenerator 831 deg. C. The average temperature at the incoming end of the mixer was 1411 deg. C., in the middle 1382 deg. C., and at the outgoing end 1363 deg. C. The gas and air evidently mixed so well that combustion took place immediately on entering the furnace, where the highest temperature was produced.

The temperature of the iron leaving the mixer naturally shows lower than that of the mixer, the average being 1302 deg. C., which was held uniform within plus or minus 2 per cent. The iron furnished to the foundry was therefore practically uniform in temperature. In regard to metallurgical conditions 103.96 metric tons of iron from two different blast furnaces were poured into the mixer during the test. The details of composition are shown in Table 1, Test No. 1, and the iron leaving the mixer in Table 2, Test No. 2.

*Table 1—Composition of Pig Iron Entering Mixer*

| Test | Time | Weight, Lbs. | Temp., Deg. C. | Analysis Poured Into Mixer: Silicon, Per Cent | Mang., Per Cent | Sulphur, Per Cent |
|---|---|---|---|---|---|---|
| 1.. | 7.45 | 37,015 | .... | 1.77 | 0.64 | 0.022 |
| | 9.30 | 40,322 | 1,250 | 1.99 | 0.57 | 0.044 |
| | 11 45 | 38,008 | .... | 1.69 | 0.57 | 0.066 |
| | 12.15 | 37,611 | 1,270 | 2.01 | 0.64 | 0.044 |
| | 2.00 | 36,442 | 1,250 | 1.79 | 0.60 | 0.066 |
| | 3.50 | 39,793 | 1,260 | 1.71 | 0.58 | 0.086 |
| | Total..... | 229,191 | ..... | ..... | ..... | ..... |
| | Averages. | ..... | 1,258 | 1.82 | 0.60 | 0.053 |
| 2.. | 7.00 | 37,103 | .... | 2.38 | 0.66 | 0.03 |
| | 10.25 | 37,699 | 1,285 | 2.32 | 0.66 | 0.028 |
| | 12.30 | 35,912 | 1,300 | 2.32 | 0.70 | 0.022 |
| | 12.45 | 18,739 | 1,240 | 1.75 | 0.50 | 0.10 |
| | 3.45 | 33,289 | 1,280 | 1.72 | 0.58 | 0.07 |
| | 4.15 | 18,739 | 1,260 | 1.75 | 0.56 | 0.10 |
| | Total..... | 181,481 | .... | .... | .... | .... |
| | Averages. | ..... | 1,273 | 2.10 | 0.61 | 0.04 |
| 3.. | 8.00 | 32,871 | .... | 2.08 | 0.97 | 0.038 |
| | 11.30 | 40,741 | 1,285 | 2.55 | 0.90 | 0.014 |
| | 12.00 | 18,739 | 1,180 | 1.67 | 0.54 | 0.108 |
| | 1.20 | 33,642 | 1,270 | 2.14 | 0.85 | 0.030 |
| | 1.30 | 17,637 | 1,190 | 1.78 | 0.54 | 0.082 |
| | 3.20 | 41,578 | 1,270 | 1.38 | 0.80 | 0.038 |
| | 4.35 | 39,419 | 1,310 | 2.15 | 0.90 | 0.018 |
| | Total..... | 224,627 | .... | .... | .... | .... |
| | Averages. | ..... | 1,251 | 1.94 | 0.81 | 0.038 |
| 4.. | 8.30 | 34,149 | 1,335 | 1.82 | 0.90 | 0.03 |
| | 10.00 | 32,231 | 1,220 | 1.38 | 0.63 | 0.17 |
| | 11.30 | 32,628 | 1,330 | 1.98 | 0.92 | 0.03 |
| | 12.20 | 35,648 | 1,240 | 1.67 | 0.74 | 0.11 |
| | 1.30 | 34,700 | .... | 1.28 | 0.44 | 0.13 |
| | 2.40 | 34,281 | 1,270 | 2.23 | 0.69 | 0.12 |
| | 4.15 | 32,672 | 1,260 | 1.20 | 0.47 | 0.10 |
| | Total..... | 236,309 | .... | .... | .... | .... |
| | Averages. | ..... | 1,276 | 1.65 | 0.68 | 0.107 |

The iron had the following composition:

| | Silicon, Per Cent | Manganese, Per Cent | Sulphur, Per Cent |
|---|---|---|---|
| Entering mixer ..... | 1.82 | 0.60 | 0.053 |
| Leaving mixer ..... | 1.88 | 0.51 | 0.052 |

While the silicon in the pig iron varies from 1.69 to 2.01 per cent, that of the mixer iron only varies from 1.79 to 1.95 per cent. The sulphur in

the pig iron varies from 0.022 to 0.086 per cent, while the mixer iron only varies from 0.046 to 0.058 per cent. The mixer iron therefore shows much greater uniformity.

*Second Test, Mostly Blast-Furnace Gas.*—With the second test the mixed gases had the same composition as before, but for the last two hours no coke-oven gas could be obtained, blast-furnace gas alone being used containing 26.8 per cent CO, 10 per cent $CO_2$. The average temperature of the air regenerator was 934 deg. C. and of the gas regenerator 705 deg. C. Average temperatures in the mixer were 1379 deg. at the incoming end, 1389 deg. in the middle, and 1378 deg. C. at the outgoing end. The temperature decreased steadily toward the end of the test, but this was not so much due to the use of blast-furnace gas alone as to the fact that a great many casts were made. The mixer

*Table 2—Composition of Iron Leaving Mixer*

| Test | Time | Silicon, Per Cent | Manganese, Per Cent | Sulphur, Per Cent |
|---|---|---|---|---|
| 1 | 8.00 | 1.93 | 0.53 | 0.052 |
| | 9.00 | 1.95 | 0.48 | 0.046 |
| | 10.00 | 1.90 | 0.48 | 0.054 |
| | 11.00 | 1.98 | 0.48 | 0.046 |
| | 1.30 | 1.82 | 0.50 | 0.052 |
| | 4.00 | 1.82 | 0.55 | 0.056 |
| | 4.30 | 1.79 | 0.56 | 0.058 |
| | Averages | 1.88 | 0.51 | 0.052 |
| 2 | 8.00 | 1.78 | 0.63 | 0.054 |
| | 8.45 | 1.60 | 0.58 | 0.054 |
| | 9.30 | 1.73 | 0.50 | 0.046 |
| | 10.15 | 1.70 | 0.48 | 0.054 |
| | 11.20 | 1.84 | 0.63 | 0.046 |
| | 11.45 | 1.77 | 0.44 | 0.048 |
| | 1.00 | 1.71 | 0.59 | 0.020 |
| | 1.30 | 1.86 | 0.59 | 0.038 |
| | 2.10 | 1.84 | 0.53 | 0.046 |
| | 3.15 | 1.82 | 0.56 | 0.040 |
| | 3.40 | 1.82 | 0.55 | 0.034 |
| | 5.00 | 1.77 | 0.50 | 0.032 |
| | Averages | 1.77 | 0.55 | 0.043 |
| 3 | 9.45 | 2.20 | 0.55 | 0.050 |
| | 10.00 | 2.14 | 0.53 | 0.048 |
| | 10.15 | 2.01 | 0.47 | 0.050 |
| | 10.40 | 1.87 | 0.58 | 0.054 |
| | 11.15 | 2.10 | 0.50 | 0.046 |
| | 11.35 | 2.16 | 0.53 | 0.036 |
| | 12.45 | 2.08 | 0.57 | 0.052 |
| | 4.20 | 1.86 | 0.65 | 0.040 |
| | 4.30 | 1.77 | 0.47 | 0.042 |
| | 5.45 | 1.84 | 0.50 | 0.036 |
| | Averages | 1.96 | 0.54 | 0.045 |
| 4 | 8.00 | 1.90 | 0.61 | 0.100 |
| | 8.30 | 2.11 | 0.56 | 0.080 |
| | 9.00 | 2.19 | 0.73 | 0.080 |
| | 10.10 | 2.01 | 0.67 | 0.130 |
| | 11.00 | 1.64 | 0.67 | 0.090 |
| | 1.30 | 1.67 | 0.77 | 0.090 |
| | 3.00 | 1.54 | 0.61 | 0.110 |
| | 4.00 | 1.74 | 0.93 | 0.110 |
| | Averages | 1.85 | 0.69 | 0.099 |

was therefore often inclined and the flow of gas stopped altogether and the air partly. The mixer iron while being poured out showed an average of 1307 deg. C., while the mixed gases were used, but during the last two hours it dropped to 1290 deg. and 1260 deg. C. These last temperatures do not differ from that of the pig iron entering the mixer.

The average analysis of the pig iron was silicon 2.10 per cent, manganese 0.61 per cent and sulphur 0.04 per cent, while that of the mixer iron was silicon 1.77 per cent, manganese 0.55 per cent and sulphur 0.04 per cent. The detailed figures are given in Tables 1 and 2, Test No. 2. The mixer iron shows the desired uniformity, particularly evident in the case of the sulphur. The average in both cases is 0.04 per cent, but the pig iron varies from 0.02 to 0.10 per cent, while the mixer iron only varies from 0.02 to 0.05 per cent.

### USING ONLY BLAST-FURNACE GAS

*Third Test.*—For the two remaining tests blast-furnace gas alone was used, having a heating value of 88 to 94.5 B.t.u. per cu. ft. The results were good. During Test No. 3 the air regenerator had an average temperature of 1006 deg. C. and the gas 840 deg. C. The average chimney temperature was 175 deg. C. Corresponding to these good results the mixer temperatures were good, being an average of 1410 deg. C. at the incoming end, 1393 deg. in the middle, and 1383 deg. at the outgoing end. The mixing of the blast-furnace gas and air was evidently satisfactory because the highest temperatures were found at the incoming end. The average temperature of the iron on leaving the mixer was 1325 deg. C., and on entering 1250 deg., which shows an increase of about 75 deg.

The silicon of the pig iron showed a total variation of 1.17 per cent from 1.38 to 2.55 per cent. The mixer metal on the other hand only varied from 1.77 to 2.20 per cent. There was no loss of silicon while in the mixer, the average being the same in both cases. The sulphur shows similar results, and the equalizing results brought about by the use of the mixer are well shown in the illustration. The two high sulphur casts were well taken care of.

*Fourth Test.*—In this test the average temperature of the air regenerator was 946 deg. C., and of the gas 776 deg. C. The mixer temperatures were correspondingly lower than with Test No. 3. At the incoming end the average was 1334 deg., in the middle 1301 deg. and at the outgoing end 1286 deg. C. The mixer metal had an average temperature of 1257 deg., which was 20 deg. hotter than that of the iron entering the mixer. No special effort was made to heat the iron because of its low quality and to keep the loss from being unnecessarily high. The metallurgical results are very interesting because of the high sulphur in the pig iron, which with one cast amounted to 0.17 per cent. (See Table 1.) This entered the mixer at 10 o'clock, and 10 min. after, at 10.10 metal was poured out, so that not enough time was allowed for thorough mixing. However, considerable improvement was brought about in regard to the sulphur and silicon. The mixer metal was much more uniform than the pig iron, as may be seen from Tables 1 and 2.

### GENERAL CONCLUSIONS

From the foregoing tests it is evident that heating with blast-furnace gas is sufficient for a foundry pig-iron mixer. If, however, much cold iron or scrap is to be melted up then an admixture with coke-oven gas is preferable. With too great heating the loss increases, but under ordinary conditions it may be held from 1 to 1½ per cent, as shown by a week's test. The lining must be acid so as not to influence the silicon contents of the iron, and although no desulphurization can take place, yet an equalization between high and low sulphur casts is brought about, which depends on the length of time in the mixer. It is of course best to wait as long as possible after pouring in a high sulphur cast before taking iron from the mixer.

G. B. W.

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The first car of coal was unloaded at the new Buffalo dock of the Lehigh Valley Railroad last week. It is a steel and concrete ground-level plant, replacing a wooden trestle. The machinery is operated by electricity and consists of two rocking cradles for unloading box cars and four fixed hoppers for unloading open cars. The coal will be conveyed by apron flights to a telescopic chute in the boat being loaded. It is estimated that 500 cars can be unloaded in 10 hr. The breakage of coal will be reduced to a minimum and the risk from fire, as compared with a wooden structure, will be eliminated.

# Foundrymen's Atlantic City Convention

## Papers Emphasize Industrial Education, Standardization and Costs—President Bull's Notable Address—Brass Sessions on High Plane—Record Attendance

The 1915 convention of the American Foundrymen's Association which, with that of the American Institute of Metals, was held at Atlantic City, Sept. 27 to Oct. 1, is of distinct importance as marking the inauguration of definite steps to promote the foundry trade. There is reason to believe that investigations and findings which make up the convention record will shortly take useful forms in results accomplished. The cause of industrial education, the fostering of which has become of such urgent importance, is to be definitely and systematically promoted. Further studies of materials entering into the making of castings, particularly those which have been considered the minor elements, are to be pursued to the end that exact knowledge may be had in a degree comparable with the information already in hand with respect to pig iron itself. Molding sand especially is to be better understood, and standardization of all products more definitely established.

The papers presented at the meetings added largely to the historical record of the progress in the art. The primary problem of costs was defined more completely than ever before, and a plan of cost keeping was outlined in practical detail. The meetings of the American Institute of Metals were more liberally attended than at any previous gathering, and the discussions were notably valuable and earnest. Attendance at the meetings of both associations was the largest of their history, the registration of men for the American Foundrymen's Association exceeding 500. Following the joint session of the two associations on Tuesday morning the meetings of the foundrymen were divided into gray iron, steel and malleable sessions, while the non-ferrous meetings pursued the separate program of that organization.

### Joint Opening Session

The paper presented by Prof. Frank M. Leavitt, University of Chicago, on the subject of industrial education, and the action taken with regard to it have already been referred to in THE IRON AGE of Sept. 30. The interest developed in the question of molding sands, inspired by the report of C. P. Karr of the United States Bureau of Standards has also been mentioned, as well as the appointment of the committee, with Dr. Moldenke at its head, to pursue the further investigation.

Following the above mentioned papers an interesting and instructive demonstration of the strength of safety goggles, together with an illustrated analysis of the protective qualities of lenses, of different colors and composition, in shielding the eye from the dangerous rays of high-temperature flames, was presented by F. W. King of the Julius King Optical Company, New York. The matter presented was covered in Mr. King's paper and included a demonstration of the machine and method for making drop tests of goggle lenses. Lenses were shown which withstood the impact of a dropping ball, a shock of many foot-pounds of energy and apparently of much greater severity than would ordinarily occur as the result of flying chips. The spectrum illustration disclosed many fallacies as to the efficacy of various colored lenses in the exclusion of dangerous rays.

# Meetings of the American Foundrymen's Association

The gray iron session on Tuesday afternoon was opened with the reading of a paper by President R. A. Bull entitled "Notes on Applications and Characteristics of Cores in Modern Molding." This was published in full in THE IRON AGE, Sept. 30. It was followed by an illustrated discussion of "Foundations for Jar-Ramming Molding Machines," by E. S. Carman, Osborn Mfg. Company, Cleveland. The paper pointed out the essential necessity of adequate attention to the machine foundation, not alone from the standpoint of solidity and permanence, but also with respect to accessibility to the sub-floor mechanism of the machine and to the protection of that mechanism from dust and dirt. Attention was also devoted to the taking up of vibration in the machine itself. In the brief discussion following the paper it was stated that the vibrations from jar-ramming machines were felt, not so much at the machine, as at a distance of 50 to 75 ft., where other molds were jeopardized. Mr. Carman amplified his reference to the elimination of the shock in the machine by explaining that the real ramming effect depends not so much upon the concussion shock as upon the sudden reversal of the direction of travel, and that this latter effect, properly produced, greatly reduces the amount of vibration passing into the foundation. Subsequent publication of Mr. Carman's paper will appear in THE IRON AGE.

#### MOLDING MACHINE EVOLUTION AND PATTERN-MAKING

An encyclopædic record of the history and development of the molding machine was presented by J. J. Wilson, Cadillac Motor Car Company, Detroit, in the paper prepared by himself in collaboration with A. O. Backert, editor of *The Foundry*. The paper describes and illustrates a wide variety of machines, together with the classes of work to which they are adapted. The illustrations were thrown on a screen, adding very much to the value of the paper. For the student of foundry development the ground covered in this paper should be most instructive. An exhaustive presentation of the difficulties and requirements of pattern-making for molding machine work was made by E. I. Chase, Cadillac Motor Car Company, Detroit. A review of this paper it is planned to print in these columns in an early issue.

#### FOUNDRY SCRAP SPECIFICATIONS

The report of the committee on standard specifications for foundry scrap was offered as a preliminary treatment of the subject and contained tentative specifications for steel, cast iron and malleable scrap. In view of the tentative character of the committee's recommendation, motion was made by H. Cole Estep that the subject of scrap specifications be continued with a view to establishing permanent standards commensurate with the importance of the subject. The motion had the earnest endorsement of Dr. Moldenke who referred to the typical instance of the harmful effects of burnt grate bars so often included in scrap mixtures.

### MOLDING SAND BOND AND RECLAMATION

Discussion of the subject of molding sand was resumed with the reading of a paper by W. M. Saunders, consulting chemist, Providence, R. I., entitled "Reclaiming Molding Sand." The paper dealt largely with the character of bond in molding sand and with the causes which bring about loss of bonding power as the result of heating the sand when the mold is poured. The paper points out that the bond of sand is due to the clay contained therein, and that the quality of bond varies with the quality of clay with particular respect to the colloidal properties of that clay. By reason of the contact with heat much of the colloidal property of the clay is destroyed with the consequent loss of bonding power in the sand. The reclaiming of the sand therefore depends upon the restoration of clay, and as an indicator of the extent to which the clay mixture in the sand is depleted and correspondingly, the bonding power weakened, the dye test was strongly recommended. The paper includes a description of this dye test as well as of the standard mechanical analysis of sand.

In the discussion following the paper Mr. Saunders further explained the destruction of bonding power by heat through the destruction of the organic elements in the clay with which its colloidal properties are associated, while the inorganic elements in the sand are unaffected. Asked as to what clays were best for mixing in the reclamation of used sand, Mr. Saunders stated that he had used New Jersey clays because of their accessibility, but that there were equally good clays in other parts of the country. In his opinion, where new sand is obtainable at a cost not exceeding $1.50 per ton, there is little economy in reclaiming sand by the admixture of clay. Concerning the relation of bonding power to mixture it was stated that the more intimate the association of clay with each grain of sand, short of the crushing of the sand, the better the results.

### IRREGULARITIES IN SAND

The same discussion continued with the reading of a paper by D. H. Newland, assistant state geologist, Albany, N. Y., descriptive of the "Albany Molding Sand Deposits." The origin and characteristics of these deposits and the methods of working the sand beds were described and illustrated. Criticism was made concerning the marked irregularities in quality of sand, not only from different locations, but from the same location, and the query was offered as to whether it was not possible for the sand shipper to equip in such a way as to make a determination of quality at the deposit before the sand was shipped. Some simple arrangement to accomplish this result was considered practicable. Concerning irregularities in the fineness of sand, the claim was made that this apparent irregularity was due to variation in the clay content of the sand, and that investigation had shown that the sand, isolated from the clay, presented a striking uniformity, and that there was therefore no more practical way available for testing the quality of the sand than the commonly practiced device of rubbing the sand between the fingers and thumb.

### FOUNDRY INSTRUCTION AT UNIVERSITY OF ILLINOIS

At the opening of the Wednesday morning session an excellent account of the work the University of Illinois is doing in the instruction of students in foundry practice was detailed in a paper presented by R. E. Kennedy, an instructor in that institution. Mr. Kennedy explained that the idea upon which the plan of teaching was based laid stress, not so much upon the development of manual skill in the molding operations, nor primarily upon a knowledge of the practical details involved in the mechanical production of molds, but rather upon the development in the perspective of the student, of an appreciation of the broad executive and administrative problems involved in the commercial conduct of a foundry. With this thought in mind, attention has been given to organization, scientific planning of production and accurate time study. The details of these requirements are outlined in the paper. The character of the equipment and the facilities provided are also described. The paper was especially impressive as an evidence of the progress that is being made by engineering schools in making their laboratory courses more nearly approach commercial realities.

A paper by O. J. Abell, Western editor THE IRON AGE, commented on the tendencies of merchant pig iron with particular reference to the greater flexibility in the choice of materials for the cupola charge which has come with a greater dependence upon chemical analysis. The use of off-iron and a wide variety of scrap are interesting in their bearing upon foundry economies. In the future, it was pointed out, the logical program of the merchant pig iron producer will provide for supplementing his present operations by the addition of by-product recovery plants.

### MODERN FOUNDRY ADVANCE

In an extended discussion of the problem involved, H. K. Hathaway, Tabor Mfg. Company, Philadelphia, outlined the application of scientific management to the foundry industry. The paper enters into elaborate detail, but it is planned to review it in a later issue.

Dr. Richard Moldenke, talking on the subject "The Modern Foundry Advance," as outlined in his paper under that title, entertainingly recounted much of historical interest in the improvement of foundry practice and equipment. Summarizing the various phases of modern foundry development, he called attention to the following, interpolating anecdotal discussions of each:

1.—The change in the valuation of pig iron from the unreliable method of judging it by fracture to the definite one of its actual elemental content.

2.—The introduction of machinery and processes to promote efficiency in operation and reduce shop costs; in specialty foundries, enormously so. The molding machine is the most prominent example of this advance.

3.—The study and rational use of foundry raw materials, such as molding sands, fuels, smaller supplies, etc.

4.—The machine-casting of pig iron.

5.—The standardization of methods of sampling and analysis of pig and cast iron. The preparation of standard drillings of cast iron for laboratory checking was first worked out by the foundry interests and is now a governmental activity.

6.—The classification of finished castings by their analysis ranges, so that the best composition can be selected as suited to the requirements of the case, and ready duplication is possible.

7.—The operation of gray iron and malleable foundries with scientific laboratory aid.

8.—The introduction of standard specifications for pig iron, cast iron and coke.

9.—The broadening of shop practice to include oil and gas fuels, improvement of product by steel and alloy additions, the electric furnace, etc.

10.—The study of the chemical and physical characteristics of cast iron, the results of which have taken it from the list of unreliable materials.

11.—Development along lines of foundry betterment, such as lighting, heating, sanitation, safety, efficiency and foundry education.

In connection with his reference to the practice of increasing the number of kinds of iron made from the same cupola he pointed out that on the continent it was the general practice to restrict the size of cupolas from 36 to 48 in., the latter being the more common, and to increase the number of cupolas in a foundry in proportion to the number of different kinds of iron required; whereas, in this country, the tendency has been toward cupolas of much larger diameter and the fewest number that the tonnage capacity of the foundry would permit. He gave it as his opinion that the European practice was the better, except as the higher cost of labor here modified that contention.

### FOUNDRY COSTS PLAN ENDORSED

The reading of the recommendations of the cost committee closed the session. The painstaking effort of the committee are fully evidenced in the exhaustive detail of their recommendations and in the practical operating value of the plan of cost keeping proposed. The report was submitted and read by Benjamin D.

Fuller, Westinghouse Electric & Mfg. Company, Cleveland, chairman of the committee, but space limitations preclude a review of it in this issue. The need of definite action by the association in putting into effect the recommendation of the committee was urgently emphasized and action was taken providing for a committee having authority to secure general adoption of the cost keeping system outlined.

### THE OIL-FIRED CUPOLA

In the meeting of Wednesday afternoon, Benjamin D. Fuller in the chair, interest centered in the paper presented by Bradley Stoughton descriptive of the oil-fired cupola. A description of the patent appeared in THE IRON AGE, Feb. 25, 1915, and an account of some of the practical results was given in THE IRON AGE, May 13, 1915. Following the paper, in a discussion which indicated some lack of appreciation of the status of the new process, inquiry largely concerned itself with the probabilities of coke being entirely eliminated as

R. A. BULL

Re-elected president of the American Foundrymen's Association and elected to honorary membership in the association

a supplementary fuel, and it was pointed out by Mr. Stoughton that experiment thus far had not indicated the practicability of entirely eliminating coke.

### MACHINE SHOP MAN TO INSPECT CASTINGS

In a paper entitled "The Inspection of Automobile Castings," C. B. Wilson, Wilson Foundry & Machine Company, Pontiac, Mich., stated that his company had found it a great saving to employ an experienced machine shop man to inspect all castings, and that not less than six months in the foundry was required to train a man for the position. Under this plan the percentage of rejected castings in his foundry had greatly decreased. An abstract of this paper will appear in THE IRON AGE.

The report of the committee on specifications for gray iron castings, read by W. D. Putnam, Detroit Testing Laboratories, was laid on the table, but by subsequent action of the association it was withdrawn and the work of the committee continued. An interesting description with illustrations of the various types of pouring systems in use in gray iron foundries was presented by H. Cole Estep, of the *The Foundry*, Cleveland, and the relation of these various equipments to foundry production was commented upon.

## Steel Foundry Sessions

### DYNAMIC PROPERTIES OF STEEL CASTINGS

The Thursday morning steel session opened with the reading by J. Lloyd Uhler, Union Steel Casting Company, Pittsburgh, of his paper entitled "Dynamic Properties of Steel Employed in the Manufacture of Castings of Various Types," which was published practically in full in THE IRON AGE last week. President Bull said that his own experience coincided with that described in the paper relative to the variations which had been found in the results of vibratory tests. Mr. Uhler believed the variations to be due to the surprising amount of heat generated in the tests. Bradley Stoughton, asked for his opinion as to how far the heat was a factor in causing the lack of uniformity in results, replied that he had had no experience in vibratory tests. He urged others to contribute results as they would facilitate in finding a way to determine definitely the effects of the heat treatment of castings.

### CONVERTER STEEL CASTINGS

The reading of a paper entitled "The Particular Application of the Converter in the Manufacture of Steel Castings," by C. S. Koch, Fort Pitt Steel Casting Company, McKeesport, Pa., was followed with close interest. In part, it follows:

An analysis of the history of the converter foundries of the United States seems to show that:

1.—The application of the converter to the manufacture of a general line of railroad car castings has not, to date, been a success.

2.—The use of the converter in conjunction with an open hearth furnace has not generally met with success. That is, the open hearth foundries, which have endeavored to add the converter to their equipment, have nearly always given up this process after a short trial.

3.—Iron foundries which have endeavored to add the converter to their equipment, except in favored conditions, have been unsuccessful.

4.—Various manufacturing companies, having a fair consumption of steel castings, have not by any means been satisfied with the results of making for their own use.

In almost every case it will be found that the companies which have been successful have made steel by no other process.

The tendency in some localities is for the manufacturers of large castings to encroach more and more on the field of the converter shop. During every dull period, in their desire for work, the manufacturers of large castings have gone after the more difficult jobs. This has developed their skill and given them confidence. Success was more or less dependent on restriction to small work and these latter considerations show that in the future the converter plan will be compelled to carry this restriction further.

From all of the foregoing it must not be concluded that the amount of work to be done by a converter plant is to grow less. On the contrary, new uses for steel are being found, which will give the industry more work than formerly. It is an adjustment of classes that will follow.

### CONVERTER SHOP PRACTICE

There are a few fundamental principles of operation that it may be well to mention:

1.—Unusually good cupola practice is essential.

2.—The speed of the cupola should be regulated to the speed of the converter, that is, neither too slow nor too fast.

3.—Proper crane facilities are necessary.

Holding the cupola back in any way whatever, to wait for the crane or the converter is not good practice, especially when the economical operation of the converter requires the use of a burden of perhaps 40 per cent steel scrap. Quality and temperature of iron should be considered and if a large number of heats are to be taken off, the time element is essential. As is well known, a 2-ton converter will produce steel at the rate of two tons every 20 to 25 minutes. If twelve heats are produced daily, an unnecessary delay of only five minutes per heat will aggregate one hour. It is well not to be obliged to start pouring any earlier in the day than is necessary on account of fumes and heat, but at the end of the day overtime is not only costly, but has many other disadvantages. That the ideal relationship of cupola, converter and crane is not present in many foundries is not the fault of the foreman or superintendent, but is due to original faulty design.

Most shops do not seem to aim at any particular steel temperature. The result is changed temperature conditions daily. This puts the foreman at a disadvantage in guiding his molding practice. If the ideal shop temperature is eventually attained, there still remains a difficulty. The steel will be too hot for some castings and too cold for others, and will burn in badly on some and not run others. To avoid this and many other foundry difficulties, the policy of the company should be toward a narrow range of sizes. The first step to take in the practical application of the converter to the

steel foundry is to specialize, being sure that it is on that class of work to which the converter is best adapted.

### FUTURE OF THE FOUNDRY CONVERTER

In the discussion the question was raised if there were not other reasons than locality for a lack of commercial success in the operation of converters. Mr. Koch admitted that, as in all things, faulty construction or equipment would play its detrimental part, but he believed the principal cause of failure was departing from the right line of work; and also, converters were started in territories where they faced keen open-hearth competition. In the Pittsburgh district, for instance, converters were restricted to certain kinds of castings because of the competition referred to. A point made by a member was that lack of proper operating knowledge was also a cause of failure.

Other expressions from the floor were that many gray iron foundries were swept away by the demand for steel castings and a converter was installed on the belief that its operation was merely a step secondary to casting gray iron, while some believed that it could easily be made a side issue; that in some cases the converter can compete with the open-hearth plant. To this Mr. Koch responded that open-hearth foundrymen had so increased their skill and improved their shop practice, even to the extent of using snap flasks, that they are now taking business that they previously would not consider. He believed there would be more and more progress in this direction and that the 5-ton converter may yet be found in full competition with the open-hearth furnace. A member stated that he believed it possible to make the run of a 5-ton open-hearth approximate that of a converter, and that the matter of location was not so important as the efficient operation of the furnace. Another speaker said the question was one of temperatures and that he was ready to make anything with an open-hearth furnace that can be made with a converter.

Mr. Stoughton complimented the author of the paper, saying it was a classic. He regretted the omission of any reference to capital. He held that too many converter casting projects are started where there is not a sufficient amount of money to tide over the first few months. They not only skimp in foundry equipment, but cut prices below the proper point and consequently do not succeed. In agreeing with Mr. Stoughton, Mr. Koch said this phase of the subject was a delicate one which people had better analyze and deduce their own conclusions.

### ELECTRIC FURNACE IN THE STEEL FOUNDRY

The next paper was that by James H. Gray, United States Steel Corporation, New York, entitled "Notes on Electric Furnace Construction and Operation in the Steel Foundry." The author went into the details of the construction of modern arc furnaces to such an extent that when he concluded, his paper was declared the most complete exposition of the subject ever presented to the Association. On motion the thanks of the body were extended to the author. An installment of the paper is given elsewhere in this issue.

Mr. Uhler said he had known of cases where results from an electric furnace had not been so good as those obtained with the open-hearth. Mr. Gray replied that there was no question as to the value of the freedom from oxides obtained with the electric furnace, while also to be favorably considered was the higher density and higher tensile strength so obtained. At the same time it was possible to get all kinds of results with the electric furnace as with other processes, but the irregularities found in the heat treatment of open-hearth steel were not found in electric steel. Various members agreed that good and bad steel could be produced with the electric furnace. In some places the foundry end was not properly cared for, while, as one member said, some foundrymen felt that with the installation of some new device or method all their troubles would be eliminated. Another said he did not believe the two or three per cent higher elastic limit obtainable with electric steel will be given great consideration.

Mr. Gray was asked if he could give an opinion as to the proportion of steel made by super-refinement, and whether he considered that the electric furnace will be of most importance as a primary producer. He replied that if a high percentage of scrap is used, the steel made in an open-hearth furnace is almost as good as that made in an electric furnace, and that what is being done in the way of melting scrap in the electric furnace is only a beginning. He emphasized the point made in his paper relative to transferring molten metal from a Bessemer converter or open-hearth furnace to the electric furnace.

### OPEN-HEARTH FURNACE CHECKER DESIGN

The Thursday afternoon steel session was opened with the reading, by W. A. Janssen, Bettendorf Company, Davenport, Ia., of his paper on "Open-Hearth Furnace Checker Design." The paper pointed out the growing use of silica brick in place of fire brick for checkers. While the first cost of silica brick is higher, it was stated that the question of efficiency and increased conductivity warrants their use. An installation was mentioned in which silica checker brick were employed from which 2500 heats were tapped before it became necessary to replace the brick, except the first two tapping courses at the end of the campaign.

JESSE LEE JONES

President American Institute of Metals

Jesse Lee Jones, the new President of the American Institute of Metals, was born at Martins Ferry, Ohio, in 1865. After graduating from the high school there he served an apprenticeship in a gray iron foundry. He graduated from the Ohio State University, Columbus, Ohio, in 1890 and soon after took a position with the Junction Iron & Steel Company, Mingo Junction, Ohio (now a branch of the United States Steel Corporation), where he gained experience in connection with the manufacture of steel, blast furnace work, etc. Later he was chief chemist of William Cramp & Sons Ship & Engine Building Company, Philadelphia, for nine years. There he had much to do with the manufacture of the various alloys in addition to carrying on the chemical control work. In 1903 Mr. Jones became connected with the Westinghouse Electric & Mfg. Company, being attached to the office of the manager of works. His duties were in connection with the control of the manufacture of the various metals and alloys used in this company's product. Later he was attached to the research division of the engineering department and became chief chemist, but still paying particular attention to the various foundry problems. He has been a frequent contributor to the technical press on foundry matters and is author of the text on "Brass Foundry Practice," used by the International Correspondence Schools. In his present position Mr. Jones has the technical control of the manufacture of about 35 alloys, besides having charge of all the chemical work done by the company.

### SPECIFICATIONS FOR STEEL CASTINGS

In the absence of W. C. Hamilton, American Steel Foundries, Granite City, Ill., chairman of the A. F. A. committee on specifications for steel castings, President Bull who is a member of the committee, submitted a report which recommended certain modifica-

tions of specifications for steel castings as last revised by the American Society for Testing Materials. The changes have been presented to the proper committee of the Testing Society which promised to pass upon them in time for a possible agreement of the two committees before the next meeting of the A. S. T. M.

Immediately after Mr. Bull's explanation of the changes suggested, Mr. H. E. Field, Wheeling Mold & Foundry Company, offered a motion that the proposed modifications be tabled on the ground that nothing effective would result in the establishment of the regulations. The changes proposed appeared to make the A. S. T. M. specifications more liberal. Mr. Bull said he believed the motion to be ill-advised in view of the thought that had been given to the subject by those well qualified to do so, but the motion was carried. As to the continuance of the committee no action was taken by the meeting, despite a suggestion that this matter be left for the consideration of the executive board. Mr. Bull said he supposed that under the circumstances the committee would dissolve. Mr. Bull urged upon the meeting the importance of the report and was disappointed at the turn of affairs.

### ELECTRIC ARC IN THE FOUNDRY

"The Electric Arc in the Foundry" was the title of a paper written and read by Robert E. Kinkead, Lincoln Electric Company, Cleveland, Ohio. An abstract of the paper, on which there was no discussion, follows:

The electric arc in the foundry by what is generally known as the arc welding process can be employed for reclaiming steel and malleable castings which otherwise would be scrapped due to defects originating in the casting process, such as sand spots and shrinkage cracks; for the improvement of the quality of steel and malleable castings, which would not be scrapped; for the manufacture of steel castings, which owing to their shape will always crack upon cooling and for the cutting of gates and shrink-heads.

It is stated that the effect of the heat of the arc upon the metal is the same as the effect of heat produced by any other method. Furthermore, there is no greater danger of overheating the metal than by any other method used in the foundry. The arc-welder is a motor-generator set which takes power from the supply lines at whatever voltage the power is purchased, either alternating or direct, and delivers direct current at about 75 volts. Resistance ballast is employed to bring the voltage down to 50 or 25, according to whether a carbon or metal electrode is used.

### SHRINKAGE CRACKS IN STEEL CASTINGS

Secretary Backert presented a paper, written by William R. Bossinger, Marion Steam Shovel Company, Marion, Ohio, on "Causes of Shrinkage Cracks in Steel Castings." In part, the paper stated:

Segregation will cause the formation of shrinkage cracks on the outside surface of many castings. The free use of chills is recommended, as they will reduce this defect by controlling the cooling to a greater extent than the use of brackets. Unless efforts are made to prevent the employment of chills that are too large or heavy, or which extend over the junction of heavy and light sections, the chills will increase the tendency to crack. If the chill is too large it will cause shrinkage cracks at the point of the chilled face. This is caused by the too rapid contraction of the casting directly underneath the face of the chill. When the chill is of the proper thickness, it causes the heavy part of the casting to pass through the first stage of contraction, imparting to the metal sufficient strength to meet the stresses caused by passing through the first cooling stage.

Stresses in the chilled parts of steel castings are eliminated when the proper chills are employed. The chills will absorb heat from the casting until they reach a temperature of 1400 deg. F., and on cooling with the casting all stresses should be relieved as the casting strains are released by what practically constitutes annealing at this temperature.

The use of chills is resorted to for the purpose of reducing the size of feeders on many castings. The chills are inserted in the molds over lugs and flanges that have light, thin sections on top. A chill should be of sufficient size to set the heavy section of metal before the metal in the lighter section has left its fluid state. In this way fluid steel will be carried to the chilled part and other fluid steel will be drawn from the feeder to replace metal taken from the lighter section. Another reason why the chill is to be favored in place of the use of brackets is that the chill will fall out of the mold when the casting is shaken-out, whereas the brackets have to be chipped off.

Improper gating also is frequently the cause of shrinkage cracks, forming hot spots in line with the flow of metal. If a flat casting is gated in the center and the metal is forced in one direction, causing the sand to absorb and retain heat in this section of the mold, thereby causing a hot spot in the casting resulting in a shrinkage crack, it can not be attributed to the remainder of the casting cooling and contracting in advance of the center of the hot section. To further illustrate this point, an I-beam section will be considered which is gated in the center of the web. If poured in this way, the casting will be liable to crack, as the flanges will resist contraction and the center will be weakened by the higher temperature of the metal due to the method of gating in the web and this part of the section would not have sufficient strength to withstand contraction and the crushing of the sand walls on the flanges.

### ATOMIZING OIL FOR COMBUSTION IN FURNACES

A partial report of the A. F. A. committee on steel foundry standards, Dudley Shoemaker, American Steel Foundries, Indiana Harbor, Ind., chairman, was presented by President Bull, as supervisor of basic atomization tests of the committee. The official abstract of the report which was compiled by Mr. Bull follows:

To ascertain the relative advantages and disadvantages of atomizing fuel oil with steam and air in open-hearth steel furnaces, a series of tests was undertaken under the supervision of the author on a basic furnace at the plant of the Commonwealth Steel Company, Granite City, Ill. As it was the desire to determine which of the two atomizing agents is preferable from every standpoint including cost, quality of product, etc., both in basic and acid practice, the American Steel Foundries tendered the use of its Indiana Harbor, Ind., plant for making the tests on an acid furnace. As the latter have not yet been completed, only a partial report has been presented which covers the tests made on a basic furnace.

As a result of the tests it is concluded that no relation can be drawn between the results with either superheated steam or compressed air as to the quality of the metal produced, time required for making heats, oil consumption or temperatures secured; although the oxidation losses in the two groups of heats did not vary greatly, the advantage is in favor of steam-treated heats. Since the cost of delivering the required amount of air invariably would be higher than that entailed by the delivery of the required amount of steam superheated by any such economical means as reported, there would seem to be a considerable commercial advantage in employing superheated steam as an atomizing agent in basic open-hearth practice, with no loss to the quality of the product.

Mr. Shoemaker congratulated Mr. Bull on his valuable compilation, and paid a tribute to the hard work the author had done. Mr. Bull alluded to the good work which had been done on the standardization of nozzles. Mr. Shoemaker said that as a result of the committee's work nozzles are now baked and seasoned better than they were before the subject was taken up. On the suggestion of President Bull, Mr. Janssen offered a motion, which was carried, that the committee on steel foundry standards investigate the various designs of stoppers with a view of standardizing their design.

## Malleable Session

A representative interest was displayed in the session arranged for the consideration of malleable foundry practice, with J. P. Pero, Missouri Malleable Iron Company, East St. Louis, Ill., presiding. A résumé of the several factors entering into the successful production of malleable iron was presented in the paper "An Outline to Illustrate the Interdependent Relationship of the Variable Factors in Malleable Iron Production," by L. E. Gilmore, Baltimore Malleable & Steel Company, Baltimore. The paper emphasized the importance of a knowledge of each of the separate influences upon which the character of the resultant metal is dependent, but lack of space prevents an extended abstract in this issue of THE IRON AGE.

### DUPLEXING IN A MALLEABLE FOUNDRY

A reference by Mr. Gilmore to the duplex steel practice brought out a question as to the extent to which duplexing is practiced in malleable foundries and as to whether the electric furnace and the air furnace may be operated in conjunction. In reply it was stated that the metal from a Heroult electric furnace could be brought to such a dead melt that it seemed

that the pouring of castings with it would prove quite unsatisfactory, but that adequate information was still lacking though numerous experiments were being made. It seemed much more probable that cupola melted malleable iron could be subsequently refined advantageously in an electric furnace. Referring to a statement by Mr. Gilmore that charcoal iron in malleable practice would carry a higher percentage of scrap than coke pig iron; a contrary opinion was brought out to the effect that results equally as good were obtainable using coke iron. The use of chilled cast pig iron as against sand-cast iron was estimated to result in the saving of 10 to 15 per cent in the time of melting, an economy accompanied as well by a substantial saving in fuel.

### AIR FURNACE STANDARDIZED

In the discussion of the paper presented by A. L. Pollard, Johnston Harvester Company, Batavia, N. Y., on the "Standardization of Air Furnace Practice," it was stated that heats could be made in from 4 to 6 hr. in forced draft furnaces with only a slight increase in fuel consumption as compared with 8 hr. for a heat in natural draft furnaces. The opinion prevailed that the use of forced draft was decidedly desirable in malleable practice. The discussion also dwelt upon the use of insulating brick in the lining.

The recommendations of the committee on standard specifications for malleable iron which closely followed the specifications adopted by the American Society for Testing Materials were approved with the suggestion that specific standards for the different classes of work, agricultural, implement, railroad, chains, etc., be outlined. The reduction, in the specifications presented, of the tensile strength from 40,000 to 38,000 lb. per sq. in., it was explained, was intended to compensate for the fact that the elongation requirement had been practically doubled.

### EXTENSION OF PHOSPHORUS LIMIT

Enrique Touceda, metallurgical engineer, Albany, N. Y., presented, in abstract, the results of his recent investigations into the permissible phosphorus limit in malleable iron castings. Answering a question as to the carbon and silicon contents when the phosphorus is increased, he stated that this increase could be made without reference to the variation in silicon and carbon. Regarding the effect of an increase of 0.10 per cent in phosphorus with particular reference to the effect on the fluidity of the metal, Mr. Pero stated that it would be difficult to ascertain the results of so small an increase in the amount of phosphorus in a small test, although he was certain that the fluidity would be considerably increased, evidence being had in the reduced losses from mis-runs in his plant following an increase in the phosphorus contents of their malleable iron for their light work from 0.17 to 0.28 per cent. No appreciable difference in the strength of the iron with the phosphorus increased to 0.28 per cent is apparent and the wedge test results are practically the same as when melting a mixture containing 0.17 per cent phosphorus.

Molding Machine Section of the Foundry Equipment Exhibit at Atlantic City, N. J.

# Sessions of the American Institute of Metals

The American Institute of Metals held its first independent professional session Tuesday afternoon at the Hotel Traymore. "The Influence of the Impurities of Spelter on the Cracking of Slush Castings," a subject presented by Gilbert Rigg, New Jersey Zinc Company, Newark, N. J., and Henry C. Morse brought out in the discussion that followed the conclusion that cadmium, when present in spelter, produces in it a hot short condition which unfits it for castings where power of resistance to cooling stresses is required. Lead, when present as an impurity, produces an increasingly bad effect upon the alloy, the percentage of failure being much greater than with pure spelter. Lead also produces a tendency toward heavy castings, thereby making its use uneconomical. Arsenic in the amounts in which it occurs naturally in spelter, was said to have little or no effect, but in larger proportions the results were similar to iron, and likely to produce erratic results.

Dr. H. S. Rawdon, of the United States Bureau of Standards, read a paper descriptive of "Standard Test Specimens of Zinc-Bronze," illustrating with lantern slides the different tests employed by the Bureau of Standards. President Clamer called the attention of the association to the close co-operation of the Bureau of Standards in attempting to solve many difficult metallurgical problems, and urged the members to reciprocate whenever possible, which he felt sure would be of mutual advantage.

In a paper entitled "An Investigation of Fusible Tin Boiler Plugs," by Dr. G. K. Burgess, Bureau of Standards, Washington, D. C., special attention was called to the fact that only pure tin should be used as a fusing material. He also called attention to the fact that when an impure metal is used oxidation takes place and in frequent cases the oxide has a melting point as high as 1600 deg. C. and forms often in such a way as to prevent the blowing out of the remaining tin when the latter fuses. Therefore, a plug containing a small percentage of zinc as an impurity could

not be relied on to perform the fuse for which it was intended. The subject led to the use of different deoxidizing agents, Dr. Burgess announcing that the Bureau of Standards was now making some experiments, the result of which he hoped to be able to report at the next annual meeting.

### ELECTROLYTIC COPPER A SUBSTITUTE FOR LAKE

Wednesday morning's session was opened by Thomas F. Wettstein, United Lead Company, New York, his subject being "The Effect of the Present European War on the Metal Industries." In the discussion it was revealed that more than 90 per cent of the members who formerly used Lake copper in their work, had been forced, on account of the present cost, to experiment with electrolytic copper. The results had been so satisfactory that it was predicted very few would go back to the use of Lake copper as long as there was such a wide range in the prices of the two.

The subject of sherardizing, introduced by Dr. S. Trood, United States Sherardizing Company, New Castle, Pa., called attention to a number of interesting diagrams sent the Institute by the General Electric Company, from which the results of many tests made by that company in sherardizing different articles were shown.

### DIE CASTINGS OF ALUMINUM

The Wednesday afternoon session was devoted to the consideration of aluminum and aluminum alloys, the proceedings opening with the reading by Charles Pack, Doehler Die Casting Company, Brooklyn, N. Y., of a paper entitled "Aluminum Die Casting a Commercial Achievement." In part, Mr. Pack's contribution was as follows:

The past year with its war and unparalleled metal conditions has forced the die casting industry to fight for existence.

None of the die casting alloys in general use (zinc, tin or lead base) exceed cast iron in tensile strength. It can therefore be seen that the foundation of the die casting industry must be based on the word economy. The cost of any die casting must be less than the combined cost of producing that casting in cast iron and machining to a finished product equivalent to a die casting. It will be readily seen that the cost of metal must be a vital factor to the life of the die casting industry since prohibitive prices for raw materials must exclude die casting from competition with other methods of production.

The zinc market may serve as a good illustration. As shown by the writer in 1914 approximately 85 per cent of the die castings produced were made from zinc alloys consisting of a minimum of 85 per cent zinc, the other elements being tin and copper, which having a higher market value would tend to raise the net cost of the average zinc die casting alloy to approximately 5c. per lb. above the market price of zinc. For example, with zinc at 7c., copper at 16 and tin at 40 (which prices are about the average) the cost of the average die casting alloy is 12c. per lb. This means that in order to compete with sand casting, the die casting process must show a minimum saving of about 9c. per lb. on the machining cost of the casting since the cost of cast iron does not exceed 3c per lb.

The cost of zinc (intermediate brand) on June 1 was 28c. per lb., which would bring the cost of the average die casting alloy to 31c. per lb. What this high metal cost means to the die casting industry can readily be understood by considering the fact that in order to compete, a 3-lb. die casting must show a net saving on machining cost of at least 84c.

Although there are numerous instances where die castings show a saving even at this high market, the growth of the industry must of necessity be curtailed if such conditions are to prevail unless a substitute for zinc is to be found. A careful study of the properties of the common metallic elements reveals aluminum as the "hope" of the die casting industry. The normal price of aluminum before the war was 8c., which (considering the specific gravity) makes it the cheapest non-ferrous metal obtainable and with aluminum at 35c. per lb. it exceeds only lead in cost.

It has been claimed at various times that aluminum die castings were being produced in France and Germany. The writer personally investigated the claims of one individual who had just come from France where he had discovered the "secret process" for die casting such parts as automobile crank cases, transmission gears and in fact any part from the size of a pin to the size of a large writing desk. This claim as well as many others was found to be without foundation and the writer has generally found that the term die casting was misconstrued. The practice of inserting iron parts in a sand mold at certain points to have machining, is not new, but this does not constitute die casting by which is understood the process of pouring molten metal (under pressure) into a permanent metallic mold producing castings requiring little or no machining before assembling.

That die casting is an individual industry originated in this country, is proved by the fact that licenses under the Doehler process, patented by H. H. Doehler, were sold in England, Germany, Austria-Hungary, France and Canada. The alloy used in this process is strictly aluminum copper. By strictly aluminum copper is meant that the alloy does not contain any tin, zinc or cadmium, which have been used experimentally in some aluminum alloys to aid their die casting properties. The alloy, however, is covered by patent and until the patent specifications are published, the writer is not at liberty to discuss it more fully.

In the course of experimenting upon aluminum alloys about four years ago, the writer compounded an alloy consisting of equal parts of zinc and aluminum. The finest grade of zinc obtainable was used for this experiment as well as primary domestic aluminum. The alloy was poured into ingot molds 2 in. wide, 1½ in. thick and 10 in. long. In the course of about two years the ingot began to crack and warp. Upon further exposure the cracks penetrated through the entire thickness of the ingot in the most peculiar manner.

The purchaser should carefully guard against any new untried aluminum zinc, aluminum cadmium or other mixture which had been devised to meet competition, and which are in most cases the result of mere chance mixing rather than of trained metallurgical investigation.

All die casting machines are constructed on two basic principles, viz., air machines and plunger machines. For the die casting of the higher fusing point metals, such as aluminum and its alloys, the plunger machine must be discarded because of the expansion of the cast iron of which the cylinder and plunger are made. The Doehler aluminum process is of the air machine type, the metal being forced into the permanent metallic molds under an extremely high pressure.

### COMMERCIAL LIMITATIONS OF DIE CASTINGS

The aluminum die casting, although a practical commercial proposition, cannot economically replace the zinc alloy die casting where the latter is satisfactory, despite the lower cost of the aluminum alloy for the same bulk. The cause for this, which is in fact the most serious drawback to the expansion of the industry, lies in the life of the dies. A die for zinc alloys will last almost indefinitely, whereas with aluminum alloys, the best die material obtainable to-day will not produce over 5000 castings without heat checking. When the high cost of producing dies is taken into consideration, it will readily be seen that it must add largely to the cost of the casting if a new die is to be made for every 5000 castings.

Considerable discussion followed the projection of a lantern slide showing the badly checked, or cracked, condition of a die used in making aluminum die castings. The die, made of chrome vanadium steel, which Mr. Pack said had been found most satisfactory for dies, plainly showed the checks under a microscope after 2000 castings had been made. In examining dies after they had deteriorated in the manner referred to, Mr. Pack found no changes in the steel either structurally or chemically. It had been proposed, in seeking to eliminate the trouble, to use 30 per cent nickel steel, but the difficulties and expense of machining this material precluded its use.

It was pointed out from the floor that molds used in casting brass were also subject to checking, and later on in the discussion it was brought out that the molds used in glass working were likewise affected. From this last it was concluded that the checking was at least not due to the absorption of aluminum by the steel. Mr. Pack stated that he knew of no metal on which aluminum had so little solvent effect as chromium, and he ascribed much of the "standing up" of chrome vanadium steel to its chromium content. It was agreed by Mr. Pack and several of the members that many alloys containing 50 per cent each of two metals, fifty-fifty alloys as they were called, including aluminum and zinc, disintegrate rapidly and were useless in practice. Mr. Pack said that some such combinations became powder when left undisturbed. An excess of aluminum was declared the parent of many faults in aluminum alloys.

### ALUMINO VANADIUM

"The Manufacture and Use of Alumino Vanadium" was the title of a paper read by W. W. Clark, Seymour Mfg. Company, Seymour, Conn. In part, Mr. Clark said:

The use of vanadium in non-ferrous metallurgy is an almost unsearched field. The work has been taken up by a number of investigators but has been dropped after some encouraging results because of the difficulty in obtaining a suitable alloy to carry the vanadium. Pure vanadium cannot be used in copper alloys as it melts at about 1732 deg. C., and is almost insoluble in brass, bronze, German silver, etc. It is soluble in nickel, chromium and cobalt, and forms a series of very interesting and useful alloys. Ferrovanadium cannot be used as the iron of the ferro would alloy with the brass, and would harden the metal, making it useless, if any solubility was effected at all, which is doubtful.

The first alloy which strikes the mind is an alloy of copper and vanadium. This alloy can be used to introduce the vanadium into the different metals, but it has several difficulties. The main ones of these are the cost of manufacture, the low solubility of vanadium in copper and the high melting point of the alloy. The cost is high as the alloy is hard to make and the vanadium efficiency is low.

When search was made for an alloy which would be cheaper, be more soluble in brass and bronze, and still give a vanadium content in the metal, aluminum was tried and found to work very easily. The manufacture is simple. Ingot aluminum is melted in a graphite crucible provided with a bottom tap hole. The thermit mixture of vanadic oxide and granulated aluminum is then ignited on top of the molten metal. After all has been reduced the mass is stirred and the metal tapped. It can be made in this manner in almost any percentage and can be controlled within fair limits. Later the manufacture of alumino vanadium in the electric furnace was tried, and was found to be very easily done, but the percentage of vanadium in the resulting alloy is erratic.

Vanadium is a scavenger which unites with the oxygen in the metals and, as claimed by some investigators, the nitrogen. It, however, should not be used as a scavenger as there are a number of as good and cheaper ones available. If one of these is used to cleanse the metal before adding the vanadium, the vanadium is retained and its full alloying effect is available. Vanadium in small amounts does increase the elongation and I have no doubt that if it were produced and sold at a price that would make it available it would come into general use.

### AUTOGENOUS WELDING OF ALUMINUM

E. V. Pannell, British Aluminum Company, Toronto, Ont., presented a dual paper on recent developments in aluminum, dwelling on aluminum for electrical conductors and the autogenous welding of the metal. He said that in the course of a few months aluminum will be cheaper because of increased output. Extracts from his contribution on welding follow:

The finished weld must for stability's sake be pure aluminum right through and for this reason soldering does not give permanently satisfactory results; the aluminum reacts with the components of the solder giving rise to corrosion. A perfectly soldered joint requires high temperature, a suitable flux to dissolve the oxide and the use of solder composed of nothing but aluminum; in other words, it becomes nothing but autogenous welding.

The oxy-acetylene torch together with the use of a suitable flux have solved most of the problems of aluminum welding. Previous to the introduction of this system the oxy-hydrogen flame had been used, but this latter has the disadvantage of not giving sufficiently high temperature, except for small work on light gage sheet. Pure aluminum melts at 650 deg. C., but to dissolve the oxide about 2800 deg. are necessary. In the hands of an unskilled welder oxyhydrogen would be safer and give better results, but they would bear no comparison with those obtained from the use of the acetylene flame when handled by a practised welder. In England and Germany large quantities of brewing vessels, confectionery plant, candy boilers, stills and condensing coils are now being manufactured of pure aluminum bent to shape and welded by the oxy-acetylene. In many cases, particularly in the welding of large brewing vessels, it is desirable to have a man stationed at the back of the job to hammer up the joint while still hot as the welder proceeds. This slightly increases the strength of the joint and improves its structure.

Electric Furnace Exhibit at Atlantic City with the Pangborn Display at the Left

At least one large European manufacturer adopts the method of hammering or rolling to remove the oxide, thus dispensing with the use of a flux. The joint is carefully cleaned, placed in position, heated up to about 450 deg. C. (the oxy-hydrogen flame gives sufficient heat) and then hammered or rolled. This process is useful for the manufacture of very large, thick, flat sheets, but it would be difficult to use for the manufacture of finished plant. Another field of work in which a flux is sometimes dispensed with is the repair of aluminum castings. Here the casting is heated up and puddled with the feeding stick. Experience however gives the conclusion that fluxing is the only sure means for dissolving out the oxide and facilitating a good weld.

### MELTING ALUMINUM CHIPS

"Melting Aluminum Chips" was the title of a paper read by Dr. H. W. Gillett. It was presented by permission of the director of the Bureau of Mines, inasmuch as it is based on some recent work which will be published in full as a technical paper of the bureau. In defining the difficulties encountered in melting aluminum chips, Dr. Gillett said in part:

The real trouble lies in the fact that a large proportion of the chips are only about 0.005 in. thick, and will pass a 20 mesh riddle. When such a chip melts it forms a globule

of metal about as big as a pin point. Each chip has had an infinitesimally thin film of oxide on it, formed the moment it was cut. That such thin films prevent metallic contact between aluminum surfaces is plain from the fact that a bundle of aluminum wires may be twisted together and brought up to the fusion point without welding together at all unless they are forced together so that the film is ruptured or unless a flux that will dissolve aluminum oxide is used. Each little pin-point globule is then surrounded by a film of oxide, infinitesimal in thickness or weight, but yet sufficient to keep the globules from uniting. If any fine dirt is present, this reinforces the oxide armor and makes matters worse. Many methods of melting chips have been suggested, ranging from the use of vacuum furnaces to that of patent fluxes with enticing names at 25c. per lb.

Dr. Gillett then described in detail two methods which are used on a large scale with commercial success, one known as the puddling process and the other based on the same principle as that of welding aluminum.

### HARDENING ALUMINUM BRONZES

W. M. Corse, Titanium Alloy Mfg. Company, Niagara Falls, N. Y., presented a paper on "Aluminum Bronze Alloys," which follows, in part:

In my experience with non-ferrous alloys I have never worked with a series of metals more interesting than the copper-aluminum combination. I refer particularly to the binary alloys of copper with aluminum not to exceed 15 per cent. One property that is not brought out as clearly as it might be is the hardness of these alloys. Below 7 per cent of aluminum, heat treatment does not have much, if any effect, but above that point the hardness can be varied almost at will by different heat treatments and by the addition of other elements such as iron and silicon.

This change in hardness develops new uses for the alloys which might not be noticed unless this property is determined on the differently treated samples. This is of interest to engineers and other users of bronze castings because we have been trained to think of bronze and brass as relatively soft materials. If a hardness of over one hundred Brinell is desired, it is not easy to obtain unless the metal becomes brittle and therefore not always practical for the particular use in mind. Frequently, therefore, steel is used when a bronze would be preferred either on account of its non-corrosive or its anti-fractional properties if a hard material is wanted.

Aluminum bronze alloys of approximately 10 per cent aluminum possess properties very similar to a Swedish Bessemer steel of 0.35 per cent carbon, including the property of being hardened by heat treatment. For instance, heating this alloy to different temperatures up to 800 deg. C. will give on quenching hardness numbers varying from 100 Brinell to 260 Brinell. This varies somewhat with the area of the cross section of the piece. Many uses immediately suggest themselves for bronzes with hardness above that of 100 Brinell, particularly, as happens in this case, if the bronze possesses good bearing qualities. We have seen bearings heat-treated in a manner similar to that mentioned above put into machinery running 20,000 r.p.m. and give excellent results. Softer bronzes were failures in such places because they would not hold their shape under the severe conditions named.

Many places can be thought of where a bearing has to stand high compression as in a bridge. For such conditions a hard bronze is essential. The following table gives the results of a titanium aluminum bronze containing 10 per cent aluminum before and after heat treatment:

| | Original Cast Alloy | Quench Alloy | Special Heat-Treatment |
|---|---|---|---|
| Elastic limit, lb. per sq. ft... | 19,800 | 40,500 | 56,700 to 39,300 |
| Tensile strength, lb. per sq. in. | 74,000 | 105,200 | 96,700 to 91,200 |
| Elongation in 2 per cent..... | 19.5 | 1.0 | 5.5 to 14.0 |
| Reduction of area, per cent.. | 23.7 | 0.8 | 9.1 to 18.5 |
| Hardness, Brinell No..... | 100 | 262 | 158 to 146 |

# Business Sessions of the Two Associations

The business meeting of the American Foundrymen's Association, held Wednesday evening, acquired greatest importanee through the delivery of the president's annual address. In its complete covering of what had been accomplished in the year and in its suggestions of policy and endeavor for the future, the record and purpose of the association were epitomized. By motion of J. S. Seaman, honorary membership in the association was conferred upon President Bull, whose re-election to the presidential office made that honor unique. In addition to the re-elections of President Bull and Secretary Backert and the choice of J. P. Pero as senior vice-president, as noted in last week's issue, the following vice-presidents were elected: Henry A. Carpenter, General Fire Extinguisher Company, Providence, R. I.; S. B. Chadsey, Massey-Harris Company, Ltd., Toronto, Ont.; Alexander T. Drysdale, U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.; H. E. Field, Wheeling Mold & Foundry Company, Wheeling, W. Va.; Benjamin D. Fuller, Westinghouse Electric & Mfg. Company, Cleveland; W. A. Janssen, Bettendorff Company, Davenport, Iowa; H. B. Swan, Cadillac Motor Car Company, Detroit; A. H. Thomas, Buckeye Steel Castings Company, Columbus, Ohio; Walter Wood, R. D. Wood & Co., Philadelphia.

Respectful and appropriate remembrance of the deaths of Thomas D. West and E. H. Mumford took form at this meeting in the adoption of resolutions presented by Dr. Moldenke.

The officers chosen by the American Institute of Metals were: President, Jesse L. Jones, Westinghouse Electric & Mfg. Company, Pittsburgh; secretary-treasurer, W. M. Corse, Titanium Alloy Mfg. Company, Niagara Falls, N. Y., and the following vice-presidents: W. G. Harris; E. B. Horne, foundry superintendent Packard Motor Car Company, Detroit; William B. Price, Waterbury, Conn.; E. A. Barnes; Dr. G. K. Burgess, Bureau of Standards, Washington, D. C.; F. H. Schutz, H. Mueller Mfg. Company, Decatur, Ill.; H. S. Gullick; Decourcy Browne, Goldschmidt Thermit Company, New York; R. S. B. Wallace, National Cash Register Company, Dayton; George C. Stone, New Jersey Zinc Company.

RESOLVED: That in the death of

THOMAS D. WEST,

the American Foundrymen's Association has lost one of its most illustrious members and the foundry industry a great pioneer in the modern foundry advance.

An investigator, author, philanthropist, a leader of men, a faithful friend and teacher of foundrymen the world over, his place will be hard to fill.

No man was more zealous in delving into the mysteries of the art of founding; no man more unselfish in dedicating his work for the benefit of his fellow man.

His courage and indomitable will in introducing knowledge and betterment into shop and community stamped him a man of broad attainment, who might well be patterned after by future generations of foundrymen.

His works will live after him.

## Extracts of Address of President Bull

A departure will have been observed this year in the establishment of numerous standing committees. In the past twelve months no less than 60 committee members of this association have been actively engaged in making investigations and tabulating data concerning problems which face the foundryman to-day. The results have been most flattering, and have proved that there was real need for such detailed work.

### THE INTEREST OF MALLEABLE IRON FOUNDERS

It is with much satisfaction that I direct your attention to the greater interest now taken in our association by malleable iron founders. They, like the steel founders, have perceived the wisdom of allying themselves with our association, and of thus deriving the benefits secured by interchange of ideas. I would be ignoring an obligation if I did not publicly thank vice-president J. P. Pero, Sr., who has had much to do with

securing the more active co-operation with us of the men in the malleable industry. We are, I believe, rapidly nearing the time when we shall fully accomplish the broad cardinal purpose of our association as defined in our constitution in these words: "The objects of this Association shall be the advancement of the interests of foundry operators, or all who are concerned in the casting of any kind of metal in sand or loam molds, for any purpose."

### ALLIED RELATIONS

Our relations with our allies, the American Institute of Metals and the Foundry & Machine Exhibition Company, have been of the most cordial and mutually helpful nature. The Institute of Metals has thus far found it wise to continue as an independent but related body, and is sensible of our kindly attitude of welcome, as exemplified in the instance of the absorption by us of the Associated Foundry Foremen. The Exhibition Company has extended every consideration that could have been suggested throughout the entire year, and it has been fully demonstrated that a commercial organization can cooperate with a purely technical body in the most harmonious way toward an end sought by both, and impossible of complete attainment by either acting alone. I take this occasion to express publicly my gratification at the courteous, helpful attitude of the officers of the Exhibition Company as maintained throughout the year toward your officers. To establish more satisfactorily the relations between that company and your Association, I recommend that you authorize your board to make such arrangements governing future co-operation with that representing the Exhibition Company as may seem advisable. The spirit of co-operation which now inspires the various organizations interested in these conventions, is most satisfying, and should be zealously fostered by all who have to do with either group.

### STANDARD SPECIFICATIONS

The co-operative work performed by three of our important committees and those of similar character representing the American Society for Testing Materials has resulted in the discussion of specifications for gray iron, malleable iron and steel castings, which it is believed will find more popular acceptance than specifications previously drawn. We have found the Testing Society glad to combine forces with us in this matter, and believe an important advance step has been made. The relation of other technical societies toward ourselves was made closer during the past year through a suggestion to us from the Testing Society's committee on specifications for coke that standard methods for analyzing coke be jointly worked out and adopted by the American Chemical Society, the American Society for Testing Materials and the American Foundrymen's Association. Your president, though not so empowered by the association, felt no hesitancy in appointing a committee which has had much profitable discussion with the committees from the other organizations.

The standards that will eventually be suggested for your adoption will, it is hoped, serve the best interests of producer and consumer. This co-operative work augurs well for the greater usefulness of our body and could, perhaps, be introduced advantageously into our safety propaganda by collaboration with the Conference Board on Safety and Sanitation, now representing the National Founders' Association, the National Association of Manufacturers, the National Metal Trades Association and the National Electric Light Association. Such co-operation, I am assured, would be welcomed by the organizations now joining forces in advocating "Safety First," and the pro-rated yearly expense which would be borne by our body, estimated at $350 a year, and restricted to a maximum amount of $500 annually, would, in my opinion, be justified at least for one year's experiment as soon as the state of our treasury permits.

### OTHER CO-OPERATION WITH SOCIETIES

Mention of co-operation with organizations should not be passed without reference to the fact that we were this year invited to join forces with more than twenty other scientific bodies in a movement to classify the literature of applied science. Thus far the expense of our participation in this work has been insignificant, but the results, it is thought, will be very valuable.

The Secretary of State at Washington, and the Director-General of the Pan-American Union have formally invited us to have an official delegate attend the sessions of the Second Pan-American Scientific Congress to be held at the capital city from Dec. 27, 1915, to Jan. 8, 1916, and Past-President Stanley G. Flagg, Jr., will represent us.

It has been suggested by the National Founders' Association that we co-operate with that body, the National Metal Trades Association, the National Association of Manufacturers, and the United Typothetæ of America in the joint conference board on industrial education. The expense to each organization affiliated is now $100 per annum. There is some difference of opinion with respect to the methods to be pursued in furthering industrial training which in the abstract all progressive persons wish to encourage. And whether it may or may not seem best to the association that this organization join in the activities of the conference board, the knowledge that our participation is courteously invited is pleasing.

The invitation of the U. S. Bureau of Standards to us to work with the Bureau and other scientific bodies in making investigations, which was affirmatively passed upon by vote of this association in the present meeting, promises well for our larger usefulness, and is the latest evidence of co-operation.

Our committee expense for the year past has totaled about $300, all that seemed wise to appropriate under prevailing conditions. If it were possible for more of our committees to carry on research work and for some of them to issue occasional bulletins approved by our officers, to all of the members, the educational value of the organization would be greatly enhanced. I sincerely trust that it will be found advisable in the coming year to undertake more investigations and some publicity work along conservative lines. The helpful feature of bulletins in organization work is attested by the reception accorded those relating to safety issued by the National Founders' Association.

RESOLVED: That in the death of

EDGAR H. MUMFORD,

the American Foundrymen's Association, as well as the foundry world, has lost a man of rare attainments.

He was cultured, kind of heart, ever ready to help the cause of industrial education; an inventor of marked ability; endowed with unbounded enthusiasm in his chosen field; an ornament in the group of workers who are striving to conserve human energy while advancing civilization.

He was one of nature's gentlemen, whose worth was appreciated by all who knew him; an example of righteousness in daily life, and a shining star in the gallery of distinguished men affiliated with the foundry industry.

### NO OFFICIAL CHEMIST YET

I have received and submitted to the Board several proposals from commercial laboratories which hold membership in the Association and which would be pleased to be designated as its official chemist, and as such to make investigations and determinations for this body, in return for the prestige attaching to the appointment. In my judgment an official chemist should be named when, but not before, there are assured facilities for systematic research work by a reasonable number of committees. It would be enlightening for the members to express their views on this matter, which, following some discussion, should, I think, be referred

to the board with power to act when the time is deemed propitious.

FORMATION OF LOCAL SECTIONS

The situation existing with regard to local foundrymen's organizations in several large centers, together with the need for closer relations between our body and its individual members, should make us consider if we may not soon apply the method of having local sections which has met with much success in several engineering and scientific societies. Your president is aware of several local organizations of foundrymen which are having indifferent success. I offer for your future consideration, the suggestion that we ascertain the attitude of the various localized groups of foundrymen toward the idea of merging into local sections of the American Foundrymen's Association. This action, as it seems to me, would redound to the greater and better influence of centralized groups, and of the parent body. In voicing this opinion, I do not detract in the least from the very great usefulness and healthy condition of foundry organizations found in some of our cities. A necessary feature of this plan involves some financial and other aid from the national organization, whose ability to provide such is materially assisted by the larger membership resulting.

THE OVER-EMPHASIS ON SPECIALIZATION

Specialization may be overdone and can do great injury to plants and workmen if not skillfully kept in proper bounds. It is essential that we keep in mind the highest development of workmen as well as of machines, and avoid making these terms synonymous. If we do not, we shall surely and justly suffer from a dearth of skilled mechanics.

The average workman of to-day argues that the manufacturer is constantly striving to displace men with mechanism. The progressive plant owner will admit the necessity of utilizing mechanical devices wherever these may profitably supersede manual labor, in order that he may meet competition. The intelligent buyer favors the mechanically produced article, in the belief, in the main correct, that it is more accurately made. But the whole trend of industrial progress creates a greater need to-day for skilled mechanics in greatly diversified lines than ever before existed, and I think we want to take good care of our craftsmen and help to make them better ones. Further, we should, as wisely recommended by our committee on industrial education, aggressively but tactfully do all that we can toward creating in our schools, a source of supply of intelligent workmen. We do not want to get rid of the skilled mechanic, but rather do we need to apply his trained hands and mind to work that he can best do, and to gradually develop him in all ways that may enable him to better himself and ourselves. Specialization is necessary, but it has its own limitations, if we give proper heed to our future need for skilled workmen as our processes develop and if we do not have solely in mind the immediate present.

THE RISE OF THE FOUNDRY CALLING

The larger foundries happily have to-day in their service a great number of technical experts and metallurgists of ability. Such men working in conjunction with those having practical knowledge of foundry conditions are developing research work along constructive lines which promises much for the future. It is not a matter for surprise that the intensely interesting and to some extent mysterious transformations that daily occur within the prosaic walls of the foundry have drawn to us such intelligent and inquiring minds, that gradually our occupation as foundrymen has been elevated from a mere calling, as it was regarded yesterday, to an honored profession, as it is acknowledged to-day.

I believe I am voicing the thought that is now in your minds when I say that the main factor in all this advancement, this search for knowledge, this growth in personnel, this exchange of ideas, which, combined have brought about the present gratifying conditions, and which promise so much for to-morrow, has been our own organization. That simple statement needs no reiteration or embellishment. Foundrymen must admit its truth, and in the admission feel honest pride in, and renewed loyalty to, the American Foundrymen's Association.

# The Annual Exhibit of Foundry Equipment

## Electric and Hydraulic Power for Molding Machines—Jar-ramming in Increasing Favor—Combination Machines

The annual exhibit under the direction of the Foundry & Machine Exhibition Company, held at Atlantic City, in conjunction with the meetings of the allied foundrymen's associations, reaped the advantages of current business conditions. Pressing need of equipment was continually manifested in the unusual volume of inquiry and the liberal placing of orders. In its suggestive influence and informative value the exhibit was both varied and complete, although the absence of machine tool display, for reasons which hardly need explanation, deprived the exhibit of a feature which has been important and valuable in other years. Small tools, supplies and auxiliary equipment were fully represented.

MOLDING MACHINES

In the showing of foundry equipment the improvements upon which emphasis was placed were in the direction of adding the function of jar-ramming to an increasing number of types of molding machines, the adoption of electric power drive for molding machines, increases in the capacities of machines and a further combining of jolt, roll-over and draw operations with power manipulation. The electric furnace had its first demonstration as an operating exhibit, and improvements in sand blast machinery were also notable. With the tendency toward greater power for molding machines of the squeezer type has come the introduction of hydraulic equipment, and this exhibit presented the first display of a machine of this type.

The hydraulic squeezer-type machine exhibited by Henry E. Pridmore, Chicago, promises to be the forerunner of an extensive line of equipment using this medium. The machine is driven by a 1-hp. motor operating simple crank and plunger pumps with a quart of oil as the circulating fluid. A machine of this size is capable of tremendous power, in excess perhaps of any requirements other than the most severe needs of the steel foundry. With fractional horsepower motors for lesser requirements, an exceedingly cheap power cost is made available for all ordinary molding machine work, while the self contained and simple character of the power is conspicuously an advantage. The floor space requirements are a minimum.

The equipping of molding machines with electric drive, while further advanced, had its first operating display as an accepted commercial unit. The Osborn Mfg. Company, Cleveland, Ohio, presented an electrically-operated jolt, roll-over and draw machine, power for which is supplied by two intermittent service, high torque motors, one for the jolt-ramming and roll-over, and the other for the draw. The claims of materially cheaper power cost, based on the fact that the motors ar automatically regulated to operate intermittently for intervals not exceeding 1 sec. in the performance of any operation, and the convenience of adding such a unit to air equipment already installed where the available air supply is already taxed, suggest a large field for this alternative. An incidental feature of this machine is the automatic control of the motor

to provide, in jolt-ramming, an upward power impulse to be given to the piston at the instant of rebound from the downward stroke, with the result that a second and supplemental ramming is given to the sand with each stroke.

Electric power is offered by the Tabor Mfg. Company, Philadelphia, in the drive of its shockless jolt-ramming, roll-over and draw machine, which it exhibited in two sizes, the smaller one a portable machine mounted on wheels. Absorption of shock in the Tabor machine is provided for in the mounting of the actuating plungers on heavy spiral springs, the plungers rising to meet the downward stroke of the piston, the shock at the point of concussion being absorbed by the springs instead of passing into the foundations. It is claimed for this machine that elaborate attention to foundations is unnecessary, and at the exhibit the machine was mounted on a temporary timber platform, supported on piling newly driven into the beach below the pier.

A new design in power, jolt, roll-over and draw machines was presented in the exhibit of the Arcade Mfg. Co., Freeport, Ill. Built for very heavy service, the operation of the machine is made positive in every respect. The roll-over is actuated by means of a rack and pinion, the pinion being on the roll-over shaft and turning the table of the machine over as the plungers on which the table rests raise it up. A further improvement in this machine consists in the use of two cylinders, a larger and smaller, on the draw side. By means of the larger cylinder the draw table is adjusted in position to suit the depth of flask used, while with the smaller cylinder the draw is made, adding, it is claimed, marked convenience to the operation of the machine. This company also displayed a rock-over machine, the frame of which is designed with an opening to permit association of the rock-over operation with a separate jolt-ramming unit, if desired. In this machine the drawing operation is provided for entirely in the draw table.

The application of two cylinders instead of one, in the interest of air economy was presented in an improved type of the Mumford, combination jolt and squeeze ramming, split pattern machine, by E. H. Mumford Company, Elizabeth, N. J. In the 14 x 16-in. machine shown, a 4½-in. cylinder for jolt ramming is located inside the 12-in. cylinder, which operates the squeeze action and thereby a saving of air, which is a function of the difference in cylinder areas, is effected without sacrifice of any of the power requirements. The inner cylinder also gives additional guide bearing. The drawing of the pattern is under the control of a special valve. The draw is started by hand leverage, permitting the operator to feel his way with the initial delicate starting of the pattern; but as the hand lever moves down, it contacts with the air control which completes the draw.

To secure a better control of the draw and a smoother action, the Herman Pneumatic Machine Company, Zelienople, Pa., has introduced oil as an equalizer for the air impulses. As applied to the small jar-ramming machine exhibited, this oil system makes unnecessary the careful opening of the valve which controls the draw. The valve may be thrown wide open, a smooth even draw being assured. A new combination jolt-ramming and squeezer machine was also shown by this company to meet conditions where the ramming of the drag by jolt and the cope by squeezer action are conveniently associated with the use of one machine. A demonstration of ramming cope-molds on a jolt machine, and without the use of a stripping plate, was made in connection with this exhibit, the essential novelty depending solely upon a rigid alignment of the flask with the pattern plate by means of a dowel.

Section of the Foundry Show Devoted to Steel Exhibits

A jolt-ramming machine with a self-contained air compressing cylinder in the base, the piston being actuated from a large inclosed spur gear acting as a crank disc and driven from a motor, was exhibited in working model form by the Vulcan Engineering Sales Company, Chicago.

### ELECTRIC FURNACE

A sustained interest was manifested in the working exhibit of the Snyder electric furnace. Except for an interval in which operation was discontinued until provision could be made for carrying off gases, two heats were melted and poured daily. The rated capacity of the unit shown is 1000 lb. per charge or 8 tons per 24 hr. of continuous operation. The exhibit included the complete control and transformer equipment involved in the installation of the furnace, and the operation of the exhibit was conducted with intent to demonstrate the claims made of simplicity of construction, economy of electrodes and low depreciation. The furnace exhibit was associated with a molding machine exhibit where molds were made with the demonstration of the acetylene torch, cutting off sprues and fins and with a sand blast cleaning exhibit in which the castings were finished.

### SAND-BLAST MACHINERY

The showing of sand blast machinery included dis-

plays among the most elaborate of the entire exhibit and improvements notably ingenious. Representative of the latter is the improved design of the self-contained, sand-blast barrel, built by the New Haven Sand Blast Company. At each end of the barrel, outside of the screen, are two parallel circumferential flights, which are continuous around the inside of the barrel and cast solid with it. In the doors of the barrel, hoppers and connections are cast which when the door is closed are so related to the above flights that as the barrel rotates and the used sand, directed from the bottom of screen into one flight, is carried up, a continuous semi-automatic, fully self-contained cleaning and reclaiming sequence is effected. The entire system is incorporated in the machine without increase in its overall dimensions.

The exhibits of the Pangborn Corporation and the Mott Sand Blast Mfg. Company were commendably complete. The Pangborn exhibit included operating units with all auxiliary equipment ranging from the cabinet size for smallest castings and hand manipulation, the small barrel, the larger inclosed barrel, the revolving table machine to the room sand-blast; and with this equipment the cleaning of a large variety of gray iron, malleable and steel castings was demonstrated.

In the past year the Whiting Foundry Equipment Company, Harvey, Ill., has developed a cupola of new design claimed to be of particular advantage in the continuous foundry, and in its exhibit emphasis was laid upon it. The novel feature rests in the elevation of the wind box from which the air is brought down through individual passages to each tuyere in a manner similar to the bustle and tuyere pipes of the blast furnace. With this design any slopping-over in the hearth is limited in its disadvantages to a filling up of the tuyere pockets. These are designed with cleanout openings through which any accumulations may be rodded out.

An extension of the size limitations within which the Wood system of taper snap molding may be practised has been developed by T. B. Wood's Sons Company, Chambersburg, Pa. A pattern was displayed from which a mold had been successfully poured, the snap flask required being 18 x 54 in. and the casting 11½ x 45¼ in., weighing 210 lb. Other similarly striking instances of the successful use of the snap flask for work of unusual requirements were shown.

In auxiliary lines of equipment many improvements were shown. The Great Western Mfg. Company has simplified its gyratory shaker, the National Engineering Company in a new revolving pan sand mixer replaces one wheel with a mixing blade, the Ingersoll Rand Company has perfected a close-quarter, pneumatic drill and a much simplified and more powerful hand grinder taking wheels up to 6 and 8 in. These and other advances were paralleled by similar improvements in similar equipment of other make, and one of the interesting reflections from such an exhibit is the equality and similarity with which progress is made in like lines of equipment.

### NEXT MEETING IN CLEVELAND

It is understood that at a meeting of the executive committee of the American Foundrymen's Association, held after the adjournment of the convention, it was practically decided to hold the 1916 convention in Cleveland.

## Larger Iron-Ore Shipments from Chile

Shipments of iron ore from the Bethlehem Steel Company's Tofo mines in Chile are reported at the rate of over 40,000 tons a month this year against 20,000 tons a month in 1914. Ore is now being loaded by a conveyor belt, capacity 2000 tons per hour, being brought from the mines 5 miles away by an aerial system of 80 tons capacity per hour. Fuel tanks for 8000 tons of oil were completed in February last and a basin dock for ships of 15,000 tons and an electric railroad are to be finished in 1917.

## Machinists' Demands at Cincinnati

Machinists in a number of shops in Cincinnati made the following demands on their employers in the past week:

Rule No. 1. Forty-eight hours a week shall constitute a week's work and shall be worked as follows: Eight and one-half hours for the first five days and five and one-half hours on Saturday; and there shall be no reduction in wage from the present weekly rate.

Rule No. 2. All overtime worked after regular hours shall be paid for at the rate of time and one-half, except Sundays and holidays, which shall be paid for at the rate of double time. When a holiday falls on Sunday the following day shall be observed.

Rule No. 3. The company agrees to meet a committee representing the employees at any time a grievance may arise in the shop, and that there shall be no discrimination against any employee who from time to time may be elected to represent his fellow workers.

Rule No. 4. The above rules are effective from the —— day of October, 1915, and shall remain in effect for one year and thereafter until thirty days' written notice is given by the employer or the employees desiring a change thereto.

Up to Monday of this week the following shops had received and refused the above demands: Cincinnati Shaper Company, Osterlein Machine Company, Rahn-Larmon Company, Ahrens-Fox Fire Engine Company, King Machine Tool Company, Willard Machine Company, Cisco Machine Tool Company, Dreses Machine Tool Company, Kelly-Koett Mfg. Company and Dalton Adding Machine Company. Demands were made on Tuesday upon eight additional firms. Cincinnati machine tool manufacturers announce that they will refuse the eight-hour day and recognition of the union in any form.

### STATEMENT BY MANUFACTURERS

While demands similar to those stated above were under discussion the machine tool manufacturers at Cincinnati posted the following under date of Sept. 23:

*To Our Employees:*

Referring to the various articles appearing in the daily press with regard to certain proposed demands to be made upon machine shop employers:

We know that the great majority of our employees is not in sympathy with this proposed action. Nevertheless, we think it best at this time to make the following statement of facts:

1. As to Hours of Work: Machine shop employers in Cincinnati during the last several years have voluntarily reduced working hours from time to time from 60 to 52½ hr. per week without reduction in pay. This they have done in advance of their competitors outside of Cincinnati.

Recent investigation shows that the great majority of these outside competitors (more than 100 of them) are now running 54 and 55 hr. per week. Only two or three of them are operating on a schedule of 52½ hr. per week or under.

Under normal business conditions this industry must meet foreign competition to maintain its export trade. Few foreign competitors are operating as low as 52½ hr. per week.

Forty-eight hours per week for machinists has thus far gone into general effect only in a certain number of shops engaged in the manufacture of war munitions, and usually in connection with the "three separate shifts" plan of operation.

Under present conditions competition is not a vital factor in the manufacture of war munitions.

2. As to Wages: The total compensation paid by this shop to its employees is in most cases higher, and certainly in all cases as high as is paid by our competitors outside of Cincinnati.

3. The policy of this company in the future as in the past will be to make working conditions, hours of work and wages as favorable to our employees as competition will permit.

4. We believe our employees will appreciate that we must consider competition in the operation of this business, and that our first duty to them and ourselves is to maintain as far as possible a steady volume of business and steady jobs for our employees at fair wages.

Less than a year ago Cincinnati machine shops were practically closed down, due to very dull business. To-day there is an opportunity for both employer and employee to prosper.

If co-operation between this company and its employees is continued in the future as in the past, still further improvements can be made in working conditions.

In view of the above facts, if demands referred to are made, we shall be obliged to refuse them, no matter what the final consequences may be.

# NEW MIDVALE PRESIDENT

## A. C. Dinkey Leaves Carnegie Steel Company—Homer D. Williams His Successor

Alva C. Dinkey tendered his resignation as president of the Carnegie Steel Company on Oct. 2 and on Monday, Oct. 4, announcement was made at New York by W. E. Corey, representing the interests which recently purchased the Midvale Steel Company, that Mr. Dinkey had been elected president of that company. The choice of Mr. Dinkey as head of the Midvale Steel Company revived reports of a consolidation of Eastern steel companies, but the belief in the steel trade has been that the Midvale Steel Company will stand by itself and that the plans of the new owners call for the intensive development of its present line of manufacture and particularly the undertaking of important work for the belligerent countries of Europe. The Midvale Steel & Ordnance Company was incorporated in Delaware Tuesday, Oct. 5, with capital stock of $100,000,000. This company will take over the Midvale Steel Company which was a Pennsylvania corporation with $9,750,000 capital stock.

ALVA C. DINKEY
President Midvale Steel Company

HOMER D. WILLIAMS
President Carnegie Steel Company

Mr. Dinkey's rapid advancement in the Carnegie Steel Company is well known in the steel trade. Chairman E. H. Gary of the United States Steel Corporation made the following statement on Monday:

"A. C. Dinkey has resigned as president of the Carnegie Steel Company in order to accept a position with the Midvale Steel Company. We are very sorry to part with him. He is one of the ablest all-around steel men in this country. He has rendered effective and satisfactory service for the Carnegie Company and his loyalty has always been undoubted. He will receive from the Midvale Company greater compensation than we could afford to pay. He has our confidence, friendship and best wishes for continued success."

Alva C. Dinkey entered the Carnegie service as water boy at Edgar Thomson steel works in May, 1879, when he was 13 years old. In 1885 he was a telegraph operator at the Edgar Thomson steel works and from 1885 to 1888 was a machinist at the Pittsburgh Locomotive Works, Allegheny, Pa. After a year of service as an expert machinist at the McTighe Electric Company, Pittsburgh, he became secretary to the superintendent of the Homestead steel works and held this position until 1893. He was electrician of the Homestead steel works from 1893 to 1898; was then superintendent of the electric light and power plant for a year; in 1899-1901 assistant to general superintendent. In 1901 when W. E. Corey became president of the Carnegie Steel Company he was made general superintendent and on Aug. 1, 1903, he was elected president.

Announcement was made in New York on Tuesday by Chairman E. H. Gary that Homer D. Williams had been made president of the Carnegie Steel Company to succeed A. C. Dinkey. He also stated that William Whigham who has been assistant to President Dinkey has been made a vice-president. The other vice-presidents are H. P. Bope and W. W. Blackburn. Mr. Williams has been for a number of years general superintendent of the Duquesne works of the Carnegie Steel Company. He was born in Johnstown, Pa., in 1863 and received his early education in the schools of Johnstown. His first work was in 1880, when he entered the employ of the Cambria Iron Company as a carbon boy. He left in 1885 and took a special course for three years in chemistry and metallurgy at Lehigh University. After graduating he went as chemist to the Joliet works of the Illinois Steel Company, and then for two years was chemist at the Colby mines, Bessemer, Mich. Later he became connected with the Colorado Fuel & Iron Company at Pueblo, Col., and for five years was night superintendent of the Bessemer department and rail mill. In 1897-1899 he was with the Maryland Steel Company at Sparrows Point, Md., leaving that company in 1899 to take charge of the Bessemer department at the Homestead steel works of the Carnegie Steel Company. For a short interval he was assistant general superintendent of the Homestead steel works and on Aug. 1, 1903, he was appointed general superintendent of the Duquesne steel works and blast furnaces of the Carnegie Steel Company at Duquesne, Pa. Mr. Williams made an unusual record at the Duquesne works in production and low cost of steel. He holds patents on several features of the merchant bar mills at the Duquesne works, which are making notable records for output. He will be a worthy successor to A. C. Dinkey, who is regarded as one of the best operating steel men in the country.

ESTABLISHED 1855

# THE IRON AGE

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## The Lake Shipbuilding Outlook

In past years the entire vessel capacity of the Great Lakes has been employed during portions of busy seasons, but the present scarcity of boats available for cargoes, amounting to a famine, is unprecedented in the history of the lake trade. The improved conditions in iron and steel created a demand for Lake Superior ore in the latter part of the summer, and additional vessel capacity was chartered to bring down this ore. This chartering of boats not previously tied up by season contracts cleaned up the bulk of the vessel tonnage that was still available. Along with this situation in the ore trade the demand for boats for grain cargoes has become greater than usual for this time of the year, due to the heavy export movement, and grain shippers soon found boats were scarce, and rates advanced sharply. Some vessel capacity was chartered last week at 5½ cents for the remainder of the season, and there are indications that, instead of easing up, rates will go still higher. A grain rate of 5½ cents means a prohibitive rate of $2 for ore, so that ore firms have no hope of securing additional vessel tonnage. This situation indicates that some of the blast furnace interests having idle stacks and now seeking to buy ore, or at least considering its purchase with the view of putting their plants in blast, will meet with disappointment.

The inadequate supply of lake boats to meet present needs calls attention to the lake shipbuilding industry, which has not had a busy season since 1911. In the past four years the ore carrying capacity of the Great Lakes has been increased very little, construction of lake boats, aside from four bulk freighters to replace those lost in the 1913 storm, being limited almost wholly to package freighters and other types of vessels. In 1913 lake ore shipments exceeded 49,000,000 tons without severely taxing the carrying capacity, and this indicates there are at present enough lake boats to bring down all of the ore next year, even if the present predictions of a record-breaking year are realized. Leading vessel interests having affiliations with steel companies usually buy boats when prices are low. Boats cost considerably more now than they cost a few months ago, owing to the advance in steel prices, and the increased cost will have a tendency to shut off orders from this source. Independent vessel interests have had several bad seasons, and are expected to go slow in investing in more boats. Lake shipbuilders, therefore, do not look for much demand for new boats for the ore trade in the next few months, but they expect that by spring their yards will be filled with orders for the Atlantic coast trade, owing to the heavy demand for such boats and the fact that Eastern shipyards are well filled with orders. A number of boats for the coast trade have been placed with lake shipyards this year, two being booked quite recently, and lake shipbuilders are now getting many inquiries from the same source for boats of the Welland Canal size.

## The Cotton Situation

A radical change in the cotton situation adds to the numerous vagaries in the trade of this year. The Government report on the condition of cotton at the beginning of October, which showed a possible yield of considerably under two-thirds of a crop, instead of plunging the South in gloom, has brought about a feeling of decided satisfaction. This is due to a rapid advance in the price of cotton to about 13 cents per pound, as compared with less than 10 cents per pound about a month ago and 6 to 7 cents per pound a year ago. Still higher prices are expected, as the production this year will fall much under the consumption and the stocks carried over from last year will hardly more than make up the deficiency. Thus, the planters who have not sold their crop in advance will realize considerably more from their short production this year than could have been obtained if the crop had come up to the expectations of the early part of the season. The cotton situation, which was the one unfavorable element in the country's trade, has thus undergone a remarkable transformation, and other sections of the country will undoubtedly rejoice with the Southern planters in this improvement in their position.

In this connection, it seems proper to call attention to the fact that, notwithstanding the placing of cotton ties on the free list by the Underwood-Simmons tariff act, this year's crop will be wholly baled with steel hoops manufactured in the United States. The supply of hoops from Europe was completely cut off, and American manufacturers had the Southern market to themselves. They were generous to the South, and instead of

charging exorbitant prices, which they could have easily done, they furnished cotton ties at a decidedly reasonable rate. The American manufacturers of cotton ties have shown in this instance, as other American manufacturers have often done, that when given a monopoly of a market, whether by tariff or by war, they refrain from taking sordid advantage of the consumer.

## Railroad Receiverships

The *Railway Age Gazette* computes that with the recent receivership of the Missouri, Kansas & Texas there is now 42,000 miles of railroad in the United States in the hands of receivers. This is a larger mileage than ever before, as the previous maximum, according to Interstate Commerce Commission figures, was 40,818 miles on June 30, 1894. This is a remarkable showing, no matter what the attendant circumstances, or the growth in total railroad mileage in the past twenty-one years. At the former time the mileage was slightly under one-fourth the total, while now the proportion is but slightly over one-sixth.

Our contemporary dwells on the magnitude of the figures involved in the present receiverships, both as to mileage and capitalization, but does not discuss the causes leading up to the condition. A general comparison between the position of the railroads in receivers' hands twenty-one years ago and those now in that plight suggests that those now in difficulty are not as strong inherently as those that were in difficulty in 1894. Then there were in receivers' hands railroads that made relatively favorable comparisons with the lucky ones that escaped receiverships. Financial difficulties reflected the times more than anything else. With many of the present receiverships the public has information suggesting that there is a specific and individual reason. It is the case of the railroad more than it is a case of the financial condition existing.

The fact that railroad receiverships are so extensive is very important, but the vital matter at issue is what they show, and in particular whether they disclose an abnormal or improper condition of the roads involved, or suggest conditions that are more or less common to all roads, but which push some over the line and still permit others to struggle along. The figures indicate that the proportion of railroads in receivers' hands is approximately the same whether one use the mileage or the capitalization as the measuring rod; in other words, that the railroads in receivers' hands are capitalized at about the same rate per mile as those that have escaped. Possibly this fact is significant. It is very doubtful if a comparison of physical values would show the same proportions. The popular impression undoubtedly is that in general the roads now in the hands of receivers have not as great physical value, per mile of line, as those not in the hands of receivers, that they have heavier burdens of capitalization, in proportion to assets, than the others. This would not of itself prove, of course, that they are definitely overcapitalized. The others might be undercapitalized, and indeed some such claim is occasionally put forth.

Whether the difficulty really lies with the particular roads that have been thrown into receiverships, or with railroads in general, it is comforting to reflect that the opportunities for correcting the situation are vastly greater than they were in the dark days of the eighteen-nineties. The country is in very sound condition financially and is improving its position steadily. The railroads have a constantly increasing volume of traffic and their earnings are increasing. The public and the particularly interested parties know that it is not because times are very bad or because money for legitimate enterprises cannot be secured, that railroads as a class or individually may find themselves in an uncomfortable position. It is because something specific is wrong that can be and must be corrected. It is also satisfactory to reflect that the old practice of correcting a condition arising from too large a capitalization by issuing additional securities has passed into history. No such remedy will be applied in these days.

## Coke Prices and Prospects

Among the commodities bought and sold in the iron trade Connellsville coke frequently presents features of exceptional market interest. The major portion of the furnace coke is sold on annual or semi-annual contracts. Thus the active periods are brief and the spells between times, when definite price trends are more or less lacking, permit the development of uncertainties so that the market finds difficulty when the time comes around, in determining what prices ought to rule. Naturally that makes the situation interesting, and another influence of the same sort is that the idea has grown that the sale and purchase of coke should represent some sort of profit-sharing scheme between the buyer and seller. Of course the basic idea is that if coke is scarce and therefore entitled to a high price marketwise, pig iron should be in heavy demand and likewise high priced. When there are prospects of improvement in the general iron and steel market the coke maker is disposed to ask the furnaceman to pay higher prices for forward coke than are ruling for prompt shipment, and if a dispute arises as to whether pig-iron prices really are going to be higher the natural recourse is to a sliding scale contract providing for advances in coke if and as pig iron advances.

All the records of coke prices show that they advance and decline, in point of percentage, more rapidly than do pig-iron prices. When pig iron has advanced 25 per cent, coke has advanced 50 per cent, 100 per cent and sometimes more. To harmonize with this fact contracts have been made in the past with a varying ratio between coke and pig iron. An extreme case would be, for instance, to fix coke at one-eighth the price of pig iron when the latter is very low, one-seventh when it is higher, and one-sixth when it is still higher.

A much simpler principle, calculated to carry out the same idea, has been the subject of most sliding scale contract negotiations lately, and that is to fix precise minimum prices for both pig iron and coke, the pig iron to be say from 7 to 7½ times the coke price, and then to have coke advance on the sliding scale by 20 per cent as much as pig iron advances. In practice this arrangement would be tantamount to a ratio contract with a constantly changing ratio. While various minimum prices may be named, contracts already closed and

those under negotiation are largely on such a basis that, with the 20 per cent increment, coke would be $2 with basic pig iron at Valley furnaces $14.25, $2.15 with pig iron at $15, $2.25 with pig iron at $15.50, $2.35 with pig iron at $16, and so on.

Inasmuch as the market has also developed coke contracts at flat prices, and flat prices are also being quoted at the moment, it becomes of interest to compare flat prices with sliding scale contracts. Business for the first half has been done at $2.25, but the usual quotation is $2.35 to $2.50 for that delivery. Coke at a flat price of $2.25 is equivalent to coke on the sliding scale contract mentioned when basic pig iron at Valley furnaces averages $15.50, or 50 cents above the market lately ruling. One might say, therefore, that in the transaction at the flat price the seller is wagering that there will not be an advance in pig iron averaging more than 50 cents a ton, while the buyer is wagering that there will be a greater advance. A sale at $2.35 would be equivalent to a sliding contract with pig iron at an average of $16, or $1 above the current market, while a buyer who paid $2.50 would evidently have to be a person afraid that pig iron in the first half of next year will average more than $16.75. There is reason to believe that the views entertained by both buyers and sellers of coke at the present time, as to the future of pig-iron prices, are decidedly more moderate than the views entertained thirty days ago, when there was much talk in coke circles of fancy prices being probable for pig iron within a few months.

It may be mentioned that coke prices are lower now in relation to pig iron, billets and finished steel products than they have been in the past when pig iron and steel ruled at present figures. That, of course, is a reflection of the increased supply of coke due to the erection of so many retort ovens.

An interesting fact brought out by present coke negotiation is that some coke producers expect prices for coke to be lower in the second half of next year than in the first half, as they would quote a slightly lower flat price for the whole of next year than they would quote for the first six months alone. That does not represent an idea that iron and steel prices in general will be lower as 1916 progresses, but is simply another shadow cast by the retort oven. There are many of these now being built and the total coke capacity available will be larger in July than in January. Apparently the coke trade feels that if it is to have fancy prices in the future it will be in the near rather than the distant future. Little if any attention seems to have been paid thus far to the possibility of a progressive labor shortage next year, progressive not alone from continued industrial expansion in general, but also progressive in that as each month passes with little or no immigration the labor supply relative to requirements is progressively decreased.

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The United States Cast Iron Pipe & Foundry Company states that it has no present intention of using molten iron from the Woodward Iron Company, as rumored at Birmingham, Ala. Its Bessemer pipe plant is located near the blast furnaces of the Woodward Company and it is expected that the pipe plant will shortly be connected with the furnace company's railroad.

## BRITISH STEEL EXPORTS

### August Figures Show Expansion—Steel-Bar Exports to France Large

Great Britain's iron and steel exports continue to increase as the war progresses. For the first eight months of this year the total, excluding iron ore and scrap, was 2,187,676 gross tons, against 3,054,263 tons to Sept. 1, 1914, a decrease of 28.5 per cent. For the first seven months the decrease was 35 per cent. The August total this year was 292,513 tons, against 203,900 tons for August, 1914, an increase of 43.5 per cent. Export values were £31,519,593 and £25,557,454 respectively for the eight-month periods.

Exports of pig iron to Sept. 1, 1915, were 251,865 tons, against 538,885 tons to Sept. 1, 1914, a decrease of 53 per cent. Italy and Sweden took the bulk of the August exports.

Steel-bar exports continue on a large scale. For August, 1915, they were 39,668 tons, compared with only 11,575 tons in August, 1914. France took 23,888 tons last month and only 196 tons in August, 1914. For the first eight months of this year, total steel-bar exports were 307,794 tons (France taking 211,244 tons), against a total of 139,508 tons to Sept. 1, 1914.

The falling off in galvanized sheet exports for the first eight months of this year was 251,167 tons, or 54 per cent, the exports to Sept. 1, 1915, being only 218,129 tons.

Ferromanganese exports in August, 1915, were about 9700 tons, compared with about 5900 tons in August, 1914. To Sept. 1, 1915, they were about 66,000 tons, which compares with about 75,000 tons to Sept. 1, 1914. Manganese ore imports in August were only 10,611 tons, against 78,156 tons in August, 1914. Imports to Sept. 1, 1915, were only 164,769 tons, against 356,330 tons to Sept. 1, 1914, a decrease of 81 per cent.

Rail exports were 32,962 tons in August, 1915, and 22,763 tons in August last year. For the first eight months of this year they were only 190,152 tons, against 326,754 tons to Sept. 1, 1914.

British imports of iron and steel, apart from iron ore and scrap, in August, 1915, were 120,863 tons, as compared with 59,304 tons in August, 1914. To Sept. 1, 1915, imports were only 766,319 tons, compared with 1,428,114 tons to Sept. 1, 1914, a decrease of nearly 46.5 per cent.

Iron-ore imports to Sept. 1, 1915, showed an increase over last year, being 4,239,167 tons, against 4,002,044 tons. Imports of crude zinc were 6309 tons in August this year and 6172 tons in August, 1914. For the eight months to Sept. 1, 1915, they were 56,049 tons, against 72,877 tons to Sept. 1, 1914.

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### September Locomotive and Car Orders

The railroads continue to show more interest in purchasing equipment. New locomotive inquiries in the last two weeks aggregate about 100. The Norfolk & Western and the Chicago Junction are inquiring for 10 locomotives each, the Central of Georgia for 12 and the Minneapolis & St. Louis for 15, while the Cincinnati, Indianapolis & Western is reported as asking for bids on 48. The Russian Government is said to be contemplating the purchase of 150 locomotives in addition to the 400 now being made by American and Canadian builders. Recent orders total 56, of which 30 are for the Norfolk & Western, to be built by the American Locomotive Company, 20 for the Philadelphia & Reading, and 6 for the Public Belt Railroad of New Orleans, which the Baldwin Locomotive Works will furnish. These orders make over 200 locomotives for September. This is at the rate of about 2500 per year, while 5000 have been ordered in good years.

Orders for cars in September are reported as 4960, against 4623 in August and 5675 in July. This is at the rate of 5000 per month for the quarter. The total to July 1 was 61,916, or over 10,000 per month; 50,000 of these, however, were ordered in May and June. It is estimated that 10,000 to 15,000 cars are now being in-

quired for [illegible] it is the expectation of the trade that at least 10,000 cars per month will represent orders for each month of the last quarter, the car shortage being more evident. If this estimate gages actual buying, the total for 1915 will be over 107,000 cars against 80,000 in 1914 and 147,000 in 1913. To Oct. 1, 1915, 77,176 had been ordered.

## Pittsburgh Steel Company's Year

The annual report of the Pittsburgh Steel Company, Frick Building, Pittsburgh, Pa., has been issued for the fiscal year ended June 30, 1915. The income account is as follows:

| | |
|---|---|
| Gross sales for the fiscal year | $11,649,863.97 |
| Previous year | 11,024,693.58 |
| Increase | $625,170.39 |
| Net profits for the year | $858,160.02 |
| Previous year | 416,550.91 |
| Increase | $441,609.11 |

Shipments of products during the year, compared with the preceding fiscal year, were as follows:

| | 1914–1915 Tons | 1914–1915 Amounts | 1913–1914 Tons | 1913–1914 Amounts |
|---|---|---|---|---|
| Pig iron, billets and bars | 62,383.64 | $1,482,439.42 | 48,847.27 | $1,257,705.24 |
| Hoops, bands and cotton ties | 36,468.14 | 1,045,573.03 | 25,238.67 | 797,092.17 |
| Wire rods, plain wire, nails, fencing, etc. | 234,920.74 | 8,829,394.48 | 219,233.06 | 8,728,353.75 |
| | 333,772.52 | $11,357,406.93 | 293,319.00 | $10,783,151.16 |
| Miscellaneous products | | 292,457.04 | | 241,542.42 |
| Totals | 333,772.52 | $11,649,863.97 | 293,319.00 | $11,024,693.58 |

The condensed balance sheet as of June 30, 1915, is as follows:

*Assets*

| | | |
|---|---|---|
| Real estate, buildings and plant | $20,167,456.30 | |
| Deferred charges written off | 1,497,100.83 | |
| Present value | | $18,670,355.47 |
| Cash in banks and on hand | | 2,134,101.32 |
| Accounts receivable | | 2,303,537.00 |
| Bills receivable | | 305,360.25 |
| Raw material and supplies in stock | | 1,585,464.64 |
| Finished and semi-finished products on hand | | 1,522,694.74 |
| Royalties and other payments in advance | | 152,348.91 |
| Deferred charges | | 14,515.18 |
| Re-acquired securities | | 10,100.00 |
| Total | | $26,698,477.51 |

*Liabilities*

| | |
|---|---|
| Preferred stock | $10,500,000.00 |
| Common stock | 7,000,000.00 |
| Pittsburgh Steel Company notes | 5,000,000.00 |
| Pittsburgh Steel Ore Company notes | 400,000.00 |
| Purchase money mortgage | 21,283.33 |
| Accounts payable | 962,501.40 |
| Reserve for repairs, replacements and contingencies | 248,286.91 |
| Surplus | 2,566,405.87 |
| Preferred stock dividend accrued for which no provision has been made | 796,250.00 |
| Total | $26,698,477.51 |

A summary of the operations of the company for the fiscal year ended June 30, 1915, follows:

| | | |
|---|---|---|
| The available cash of the company was increased from the following sources: | | |
| Net proceeds of issues of notes | | $5,136,792.26 |
| Decrease of inventories | | 236,988.09 |
| Profit from operations of all companies | | 858,160.02 |
| Amount charged to operations for reserves not represented by cash expenditure | | 131,021.76 |
| | | $6,362,962.13 |
| Of this sum there was applied in reduction of current liabilities as follows: | | |
| Bills payable | $3,470,500.00 | |
| Accounts payable | 916,050.10 | |
| Further cash was required on account of increases in the following assets: | | |
| Real estate, buildings and plant | 412,770.89 | |
| Accounts receivable | 313,812.62 | |
| Bills receivable | 217,955.95 | |
| Miscellaneous | 63,440.98 | |
| | | 5,394,530.54 |
| Leaving as the net increase in available cash | | $968,431.59 |

The open-hearth furnace the Atlanta Steel Company is now building at Atlanta, Ga., will give the company three of 45 tons capacity each.

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## Heavy Steel Rail Orders

Following the lead of the New York Central, railroads both East and West have been going into the market for rails in the past week. The largest order is for 32,000 tons, placed by the Chicago & Northwestern with the Illinois Steel Company. The Baltimore & Ohio also bought 9000 tons at Chicago and the Wabash 3000 tons, while the Chicago Great Western's initial order is 8000 tons. The New York Central is reported to have placed 5000 tons additional at Chicago and has bought 5000 tons for the Pittsburgh & Lake Erie at Pittsburgh. The Tennessee Coal, Iron & Railroad Company has booked 8000 tons for the Nashville, Chattanooga & St. Louis and 10,000 tons for the Southern Railway, the latter having placed 2000 tons also with the Pennsylvania Steel Company. An Eastern mill has received an order for 10,000 tons from the Baltimore & Ohio. The New Haven has divided its order for about 20,000 tons, the Pennsylvania, Bethlehem and Lackawanna steel companies participating. The Boston & Maine is in the market for 25,000 tons. A number of inquiries are pending at Chicago, the Great Northern, Missouri Pacific and Missouri, Kansas & Texas rail schedules aggregating about 75,000 tons. The Santa Fe will probably buy 15,000 tons. The Union Pacific placed 11,000 tons in the past week. Rail contracts with Chicago mills in September amounted to 175,000 tons, and indications are that October will equal or exceed that amount.

# NEW PIG-IRON RECORD

## September Output 95,085 Tons a Day

### A Gain of 19 Blast Furnaces Last Month—Production Still Increasing

Pig-iron production continued to climb in September and the curve on the chart went to a new high point. THE IRON AGE'S statistics show a total for the month of 2,852,561 gross tons, an average of 95,085 tons a day, or 2700 tons a day more than the previous record rate, which was 92,369 tons in February, 1913. The gain last month over the August output, which was 2,779,647 tons, or 89,666 tons a day, was more than 5400 tons a day. Twenty furnaces were blown in and only one was blown out last month. The furnaces in blast Oct. 1 numbered 268, with a capacity of 97,535 tons a day, against 249, with capacity of 91,075 tons a day, active one month previous. Production in September was at the rate of 35,000,000 tons a year, or 1,000,000 tons a year more than in the previous record month of February, 1913.

#### DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from September, 1914, is as follows:

*Daily Rate of Pig-Iron Production by Months—Gross Tons*

| | Steel works | Merchant | Total |
|---|---|---|---|
| September, 1914 | 46,344 | 16,409 | 62,753 |
| October | 41,026 | 16,335 | 57,361 |
| November | 35,305 | 15,306 | 50,611 |
| December | 33,381 | 15,515 | 48,896 |
| January, 1915 | 35,998 | 15,661 | 51,659 |
| February | 44,192 | 15,621 | 59,813 |
| March | 50,036 | 16,539 | 66,575 |
| April | 52,804 | 17,746 | 70,550 |
| May | 54,655 | 18,360 | 73,015 |
| June | 59,022 | 20,339 | 79,361 |
| July | 62,895 | 19,796 | 82,691 |
| August | 67,801 | 21,865 | 89,666 |
| September | 70,977 | 24,108 | 95,085 |

#### OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in September and the three months preceding:

*Monthly Pig-Iron Production—Gross Tons*

| | June (30 days) | July (31 days) | Aug. (31 days) | Sept. (30 days) |
|---|---|---|---|---|
| New York | 172,193 | 178,545 | 196,426 | 190,449 |
| New Jersey | 6,240 | 5,961 | 6,800 | 6,232 |
| Lehigh Valley | 64,353 | 76,683 | 87,555 | 100,714 |
| Schuylkill Valley | 53,142 | 49,985 | 69,042 | 64,988 |
| Lower Susquehanna and Lebanon Valley | 28,116 | 30,422 | 31,966 | 35,294 |
| Pittsburgh district | 595,207 | 668,500 | 699,921 | 700,248 |
| Shenango Valley | 124,041 | 134,742 | 133,249 | 144,224 |
| Western Pennsylvania | 156,350 | 160,294 | 164,777 | 164,596 |
| Maryland, Virginia and Kentucky | 43,395 | 38,671 | 45,145 | 60,247 |
| Wheeling district | 93,991 | 100,782 | 112,294 | 114,031 |
| Mahoning Valley | 299,644 | 295,679 | 310,426 | 305,564 |
| Central and Northern Ohio | 175,376 | 196,620 | 224,222 | 214,452 |
| Hocking Valley and Hanging Rock | 22,135 | 22,377 | 25,904 | 33,072 |
| Chicago district | 307,554 | 352,601 | 406,508 | 436,794 |
| Mich., Minn., Mo., Wis. and Col. | 66,168 | 71,340 | 69,628 | 75,731 |
| Alabama | 158,569 | 165,403 | 180,559 | 190,676 |
| Tennessee | 14,353 | 14,815 | 15,225 | 15,249 |
| Total | 2,380,827 | 2,563,420 | 2,779,647 | 2,852,561 |

As was the case in August, there were a number of changes in the list of active stacks in September. Among those blown in were Standish in New York, No. 2 Crane in the Lehigh Valley, one Swede in the Schuylkill Valley, one Steelton in the Lower Susquehanna Valley, one Isabella in the Pittsburgh district, Alice, Claire, one Farrell and Hall in the Shenango Valley, Crozer in Virginia, Norton in Kentucky, one LaBelle in the Wheeling district, Ironton and Lawrence in the Hanging Rock district, one Calumet and one Iroquois in the Chicago district, one North Birmingham, one Bessemer and one Vanderbilt in Alabama and Cumberland in Tennessee.

The only furnace blown out last month was one Colebrook in the Lebanon Valley.

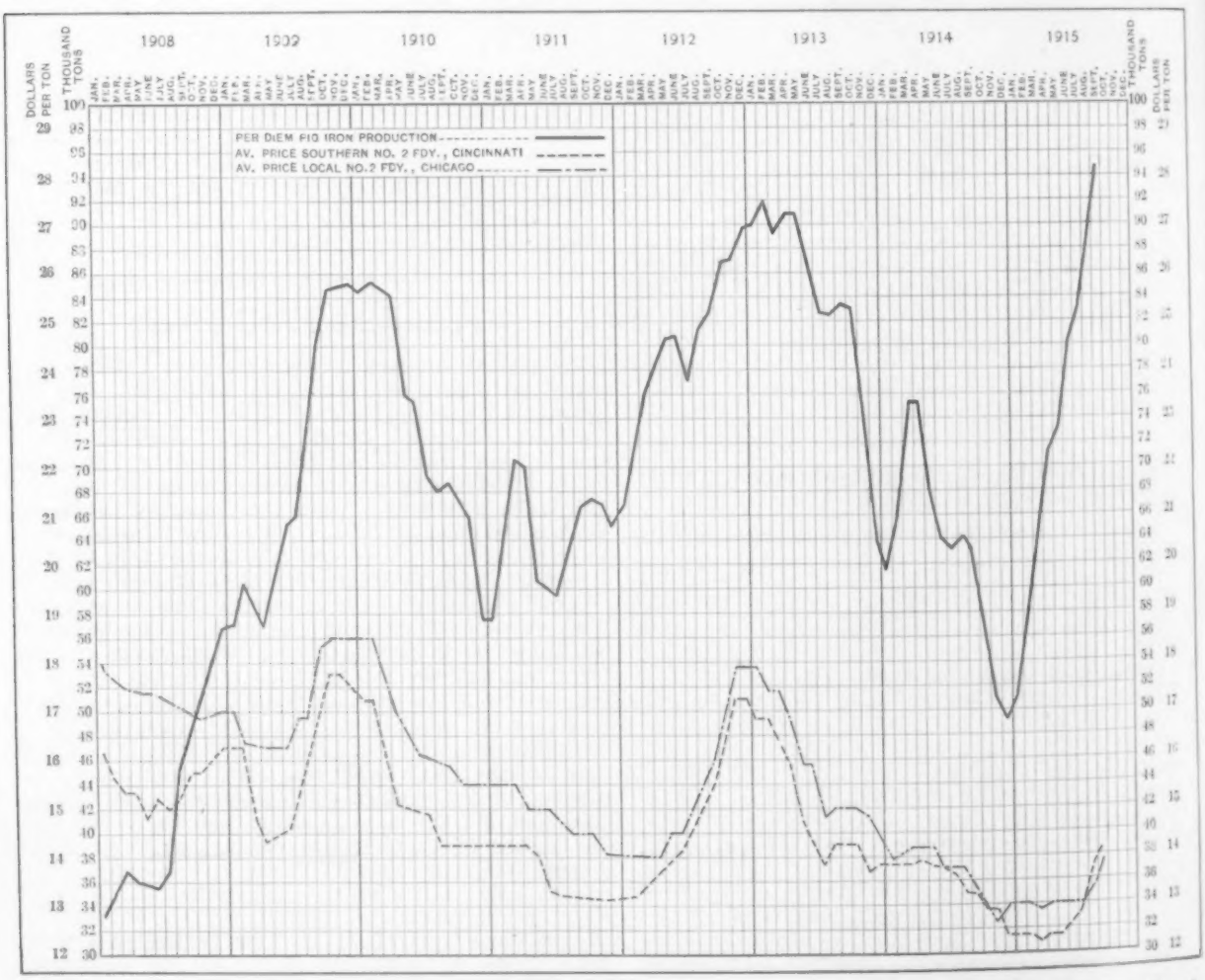


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from Jan. 1, 1908, to Oct. 1, 1915; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

### PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in the figures below, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

*Production of Steel Companies—Gross Tons*

| | Pig, total production | | | Spiegeleisen and ferromanganese | | |
|---|---|---|---|---|---|---|
| | 1913 | 1914 | 1915 | 1913 | 1914 | 1915 |
| Jan. | 1,981,560 | 1,261,430 | 1,115,944 | 15,633 | 17,325 | 18,041 |
| Feb. | 1,792,154 | 1,329,414 | 1,237,380 | 20,131 | 10,524 | 13,319 |
| Mar. | 1,904,878 | 1,704,688 | 1,551,082 | 20,546 | 20,133 | 12,274 |
| Apr. | 1,939,751 | 1,635,226 | 1,584,111 | 23,108 | 18,676 | 12,337 |
| May | 1,991,192 | 1,457,847 | 1,694,290 | 19,042 | 21,504 | 13,440 |
| June | 1,860,070 | 1,329,623 | 1,770,657 | 19,212 | 16,254 | 19,200 |
| July | 1,840,216 | 1,395,851 | 1,949,750 | 28,310 | 16,524 | 17,854 |
| Aug. | 1,833,352 | 1,455,054 | 2,101,818 | 20,680 | 11,577 | 27,463 |
| Sept. | 1,828,232 | 1,390,322 | 2,129,322 | 24,555 | 13,786 | 23,159 |
| Oct. | 1,848,634 | 1,271,820 | ..... | 19,499 | 17,435 | ..... |
| Nov. | 1,573,007 | 1,059,159 | ..... | 26,765 | 21,977 | ..... |
| Dec. | 1,298,262 | 1,034,802 | ..... | 14,095 | 20,733 | ..... |

### CAPACITY IN BLAST OCT. 1 AND SEPT. 1

The following table shows the daily capacity in gross tons of furnaces in blast Oct. 1 and Sept. 1 by districts:

*Coke and Anthracite Furnaces in Blast*

| Location of furnaces | Total number of stacks | Oct. 1 Number in blast | Oct. 1 Capacity per day | Sept. 1 Number in blast | Sept. 1 Capacity per day |
|---|---|---|---|---|---|
| *New York:* | | | | | |
| Buffalo | 19 | 16 | 5,766 | 16 | 5,956 |
| Other New York | 7 | 3 | 622 | 2 | 435 |
| New Jersey | 7 | 1 | 208 | 1 | 219 |
| *Pennsylvania:* | | | | | |
| Lehigh Valley | 22 | 12 | 3,352 | 11 | 3,045 |
| Spiegel | 2 | 2 | 204 | 2 | 213 |
| Schuylkill Val. | 15 | 8 | 2,470 | 7 | 2,217 |
| Lower Susquehanna | 7 | 4 | 1,095 | 3 | 835 |
| Lebanon Val. | 10 | 1 | 249 | 2 | 352 |
| Pittsburgh Dist. | 52 | 49 | 23,021 | 48 | 22,292 |
| Ferro | 4 | 3 | 362 | 3 | 345 |
| Shenango Val. | 19 | 16 | 5,607 | 12 | 4,685 |
| Western Pa. | 24 | 16 | 5,431 | 16 | 5,395 |
| Ferro | 1 | 1 | 56 | 1 | 60 |
| Maryland | 31 | 2 | 888 | 2 | 782 |
| Ferro | 1 | 1 | 113 | 1 | 91 |
| Wheeling Dist. | 11 | 10 | 4,115 | 9 | 3,445 |
| *Ohio:* | | | | | |
| Mahoning Val. | 25 | 22 | 10,185 | 22 | 10,050 |
| Central and Northern | 24 | 17 | 7,148 | 17 | 6,945 |
| Hocking Val. & Hang'g Rock | 15 | 8 | 1,284 | 6 | 645 |
| Ill. and Ind. | 36 | 30 | 14,590 | 28 | 13,629 |
| Michigan, Wis. & Minn. | 10 | 7 | 1,866 | 7 | 1,887 |
| Colo. and Mo. | 6 | 2 | 658 | 1 | 375 |
| Ferro | 1 | 0 | 0 | 1 | 175 |
| *The South:* | | | | | |
| Virginia | 24 | 6 | 725 | 5 | 640 |
| Kentucky | 5 | 2 | 420 | 1 | 162 |
| Alabama | 46 | 23 | 6,460 | 20 | 5,695 |
| Tennessee | 20 | 6 | 640 | 5 | 495 |
| Total | 416 | 268 | 97,535 | 249 | 91,075 |

### DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from January, 1908, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE. The figures for daily average production, beginning January, 1908, are as follows:

*Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1908—Gross Tons*

| | 1908 | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 | 1915 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 33,918 | 57,975 | 84,148 | 56,752 | 66,384 | 90,172 | 60,808 | 51,659 |
| Feb. | 37,163 | 60,976 | 85,616 | 64,090 | 72,442 | 92,369 | 67,453 | 59,813 |
| Mar. | 39,619 | 59,232 | 84,459 | 70,036 | 77,591 | 89,147 | 75,738 | 66,575 |
| Apr. | 38,289 | 57,962 | 82,792 | 68,836 | 79,181 | 91,759 | 75,665 | 70,550 |
| May | 37,693 | 60,753 | 77,102 | 61,079 | 81,051 | 91,039 | 67,506 | 73,015 |
| June | 36,444 | 64,656 | 75,516 | 59,585 | 81,358 | 87,619 | 63,916 | 79,361 |
| July | 39,287 | 67,793 | 69,305 | 57,841 | 77,738 | 82,601 | 63,150 | 82,691 |
| Aug. | 42,851 | 72,546 | 67,963 | 62,150 | 81,046 | 82,057 | 64,363 | 89,666 |
| Sept. | 47,500 | 79,507 | 68,476 | 65,903 | 82,128 | 83,531 | 62,753 | 95,085 |
| Oct. | 50,554 | 84,856 | 67,520 | 67,811 | 86,722 | 82,133 | 57,361 | ..... |
| Nov. | 51,595 | 84,917 | 63,659 | 66,648 | 87,697 | 74,453 | 50,611 | ..... |
| Dec. | 56,158 | 85,022 | 57,349 | 65,912 | 89,766 | 63,987 | 48,896 | ..... |

### THE RECORD OF PRODUCTION

*Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1911—Gross Tons*

| | 1911 | 1912 | 1913 | 1914 | 1915 |
|---|---|---|---|---|---|
| Jan. | 1,759,326 | 2,057,911 | 2,795,331 | 1,885,054 | 1,601,421 |
| Feb. | 1,794,509 | 2,100,815 | 2,586,337 | 1,888,670 | 1,674,771 |
| Mar. | 2,171,111 | 2,405,318 | 2,763,563 | 2,347,867 | 2,063,834 |
| Apr. | 2,064,086 | 2,375,436 | 2,752,761 | 2,269,955 | 2,116,494 |
| May | 1,893,456 | 2,512,582 | 2,822,217 | 2,092,686 | 2,263,470 |
| June | 1,787,566 | 2,440,745 | 2,628,565 | 1,917,783 | 2,380,827 |
| July | 1,793,068 | 2,410,889 | 2,560,646 | 1,957,645 | 2,563,420 |
| Aug. | 1,926,637 | 2,512,431 | 2,545,763 | 1,995,261 | 2,779,647 |
| Sept | 1,997,102 | 2,463,839 | 2,505,927 | 1,882,577 | 2,852,561 |
| 9 mo. | 17,186,861 | 21,279,966 | 23,961,110 | 18,237,498 | 20,296,445 |
| Oct. | 2,102,147 | 2,689,933 | 2,546,261 | 1,778,186 | ..... |
| Nov. | 1,999,433 | 2,630,854 | 2,233,123 | 1,518,316 | ..... |
| Dec. | 2,043,270 | 2,782,737 | 1,983,607 | 1,515,752 | ..... |
| Total yr. | 23,331,711 | 29,383,490 | 30,724,101 | 23,049,752 | ..... |

## Blast Furnace Notes

Claire furnace of M. A. Hanna & Co. at Sharpsville, Pa., has been put in blast. The only idle stack of this company is Fannie at West Middlesex, Pa. A pig casting machine is being installed at the latter.

One of the Bird Coleman furnaces of the Lackawanna Iron & Steel Company at Cornwall, Pa., was put in blast this week. One of the company's Colebrook furnaces at Lebanon, Pa., blew out late in August.

The No. 2 Crane furnace of the Empire Steel & Iron Company at Catasauqua, Pa., was blown in Sept. 29.

Ella furnace of Pickands, Mather & Co., at West Middlesex, Pa., is now about ready to blow in. Fannie furnace of the United Iron & Steel Company, also located at West Middlesex, will probably be blown in about Nov. 1.

For three weeks in August and for all of September the Virginia Iron, Coal & Coke Company had all its furnaces on the idle list. One Crozer furnace was blown in on Sept. 30.

The La Belle Iron Works, Steubenville, Ohio, blew in its second furnace Sept. 27. It had been idle since May, 1914.

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The Goulds Mfg. Company, Seneca Falls, N. Y., manufacturer of pumps for every service, on Oct. 1 opened a Philadelphia office at 111 North Third Street. The company has purchased the business of H. E. Trotman, who has heretofore been distributer for Goulds pumps in that territory, and has leased from him the storeroom and warehouse at the address above given. E. S. Jenison, formerly with the Canadian Fairbanks-Morse Company, Ltd., Montreal, has been appointed manager, and F. G. Kramer, formerly in the employ of H. E. Trotman, will be assistant manager. J. B. Trotman will continue with the Goulds Company. Ample stocks of the company's products will be carried. This is the third new office that it has opened in the past ten months.

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In the experiments on rail manufacture which the U. S. Bureau of Standards is conducting at the plant of the Maryland Steel Company, Sparrows Point, Md., particularly with reference to a comparison of Hadfield and domestic ingots, attempts are being made to determine whether it is possible to control the operation of the Bessemer, open-hearth and other processes by the aid of the pyrometer.

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The Belle City Malleable Iron Company, Racine, Wis., has awarded the general contract for its new electric steel foundry to Nelson & Co., in the same city. It will be of concrete, brick and steel, 80 x 320 ft., 30 ft. high, and will be ready about Jan. 1. Its equipment will include a 3-ton Heroult furnace, as previously announced in THE IRON AGE.

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Corrigan, McKinney & Co., Cleveland, Ohio, expect to place their new steel plant in operation about Jan. 1. This will provide a new source of suply for semi-finished steel. The daily output, with the plant in full operation, will be about 1500 tons of billets and sheet bars.

# The Iron and Metal Markets

## THE 3,000,000-TON MARK

### Steel Ingots and Pig Iron in October

#### Price Advances in Various Finished Lines—Rail Orders from Many Roads

September made an astonishing record for steel and pig-iron output and the pace is even faster in the first week of October. The present month, in view of the custom at all plants to strain for records in October, now promises the passing of the 3,000,000-ton mark in both pig iron and steel ingots.

While production, shipments and, in some lines, prices, are moving up, the trade is adjusting itself to the new conditions without any excitement. That domestic demand is improving is indicated this week at all buying centers. Rail orders, which are to take their turn at the mills with the enormous foreign contracts for shell steel, have come from a dozen lines in the past week. Including 32,000 tons for the Chicago & Northwestern, these contracts have amounted to more than 100,000 tons, with 25,000 tons yet to come from a New England road and 115,000 tons pending from the Great Northern, Missouri Pacific, M. K. & T. and Illinois Central.

Pig-iron production in September was 2,852,561 tons or 95,085 tons a day, well beyond the daily rate of 92,369 tons in February, 1913, the previous record month. The 268 furnaces in blast Oct. 1—a gain of nineteen in the month—had a daily capacity of 97,535 tons, and as a few furnaces have blown in in the past week pig-iron production is now at the rate of about 36,000,000 tons a year. It was 33,500,000 tons a year as September opened.

At Youngstown plans are announced for the addition of more open-hearth steel capacity. The unsatisfied demand for steel has started negotiations for two idle steel plants at other points.

The pace is assuredly rapid, but the Steel Corporation's statistics to be published at the end of the week are expected to show a moderate increase in unfilled orders.

There are evidences here and there of overselling for this final quarter of the year, and this dates back to the large contracts for the second half taken three or four months ago. Much business is now offered that cannot be taken on because deliveries cannot be made.

This situation has not caused a great pressure from buyers to get on order books for next year, but considerable business has been done for the first quarter in bars, plates and structural shapes, largely at 1.40c., Pittsburgh. The week has brought out some offers of a $2 premium on bars for prompt delivery, or a 1.50c., Pittsburgh, price.

Buying growing out of public work continues the chief support of the structural mills. Over 60,000 tons is now being figured on for Brooklyn's transportation lines. There is encouragement also in fresh railroad bridge inquiry for about 8000 tons in the East, but the building situation there offers little promise. Delivery of structural steel remains at six to eight weeks, showing that plant extensions and shipbuilding have been more than the general estimate.

The latest additions to the new work crowding Eastern shipyards are two passenger boats for the Ward Line, placed at the Cramp yard, and calling for 12,000 to 15,000 tons of plates and shapes. Another Eastern plate inquiry is for 9000 tons for 1000 Norfolk & Western gondola cars.

The week's price advances include $4 per ton on shafting, $2 on steel boiler tubes, $1 on blue annealed and black sheets, rivets, bolts, hoops and bands. Store prices at Chicago have been advanced $2 a ton for shapes, plates and bars, blue annealed sheets and rivets. The congested condition of the mills is indicated by the fact that consumers are resorting to store stocks who rarely buy there.

The wire trade had a remarkable month in September, some producers booking a record tonnage. One Pittsburgh interest has withdrawn prices, and a further advance is probable. Foreign shipments are unprecedented. A Canadian inquiry is for 10,000 to 12,000 tons of rods.

A 6000-ton lot of Bessemer iron has been under negotiation for France at $16.50, Buffalo. Freights are soaring, as high as $18 to Italy having been asked. English hematite has sold this week at 102 shillings.

There is not yet any strong pig-iron buying movement for 1916, but in spite of increasing production the market is firm with some signs of expansion in consumption. Labor troubles in the machine tool industry have made no appreciable reduction in the melt of foundry iron. Little Southern iron is to be had below $12 for No. 2.

### A Comparison of Prices

**Advances Over the Previous Week in Heavy Type. Declines in Italics**

At date, one week, one month and one year previous

| | Oct. 6, 1915. | Sept. 29, 1915. | Sept. 8, 1915. | Oct. 7, 1914. |
|---|---|---|---|---|
| **Pig Iron,** Per Gross Ton: | | | | |
| No. 2 X, Philadelphia | $16.25 | $16.25 | $16.00 | $14.75 |
| No. 2, Valley furnace | 14.75 | 14.75 | 14.50 | 13.00 |
| No. 2 Southern, Cin'ti | 14.40 | 14.40 | 13.90 | 12.90 |
| No. 2, Birmingham, Ala. | 11.50 | 11.50 | 11.00 | 10.00 |
| No. 2, furnace, Chicago* | 14.25 | 14.25 | 13.50 | 13.00 |
| Basic, del'd, eastern Pa. | 17.00 | 17.00 | 17.00 | 14.00 |
| Basic, Valley furnace | 15.00 | 15.00 | 14.50 | 13.00 |
| Bessemer, Pittsburgh | 16.95 | 16.95 | 16.95 | 14.90 |
| Malleable Bess., Ch'go* | 15.00 | 15.00 | 13.50 | 13.00 |
| Gray forge, Pittsburgh | 14.70 | 14.70 | 14.70 | 13.85 |
| L. S. charcoal, Chicago | 15.75 | 15.75 | 15.75 | 15.75 |
| **Billets, etc.** Per Gross Ton: | | | | |
| Bess. billets, Pittsburgh | 24.50 | 24.50 | 24.00 | 20.50 |
| O.-h. billets, Pittsburgh | 25.00 | 25.00 | 24.50 | 20.50 |
| O.-h. sheet bars, P'gh | 25.50 | 25.50 | 25.00 | 21.50 |
| Forging billets, base, P'gh | 33.00 | 33.00 | 32.00 | 26.00 |
| O.-h. billets, Phila. | 30.00 | 30.00 | 32.00 | 23.40 |
| Wire rods, Pittsburgh | **31.00** | 30.00 | 29.00 | 26.00 |
| **Finished Iron and Steel,** | | | | |
| Per Lb. to Large Buyers: | Cents. | Cents. | Cents. | Cents. |
| Bess. rails, heavy, at mill | 1.25 | 1.25 | 1.25 | 1.25 |
| Iron bars, Philadelphia | 1.509 | 1.509 | 1.459 | 1.12 |
| Iron bars, Pittsburgh | **1.40** | 1.35 | 1.35 | 1.15 |
| Iron bars, Chicago | 1.35 | 1.35 | 1.25 | 1.00 |
| Steel bars, Pittsburgh | **1.40** | 1.35 | 1.35 | 1.15 |
| Steel bars, New York | 1.569 | 1.569 | 1.519 | 1.31 |
| Tank plates, Pittsburgh | **1.40** | 1.35 | 1.35 | 1.15 |
| Tank plates, New York | 1.569 | 1.569 | 1.519 | 1.31 |
| Beams, etc., Pittsburgh | **1.40** | 1.35 | 1.35 | 1.15 |
| Beams, etc., New York | 1.569 | 1.569 | 1.519 | 1.31 |
| Skelp, grooved steel, P'gh | **1.40** | 1.35 | 1.30 | 1.15 |
| Skelp, sheared steel, P'gh | **1.45** | 1.40 | 1.35 | 1.20 |
| Steel hoops, Pittsburgh | 1.40 | 1.40 | 1.35 | 1.25 |

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

| Sheets, Nails and Wire. | Oct. 6, 1915. | Sept. 29, 1915. | Sept. 8, 1915. | Oct. 7, 1914. |
|---|---|---|---|---|
| Per Lb. to Large Buyers: | Cents. | Cents. | Cents. | Cents. |
| Sheets, black, No. 28, P'gh | **2.00** | 1.90 | 1.90 | 1.95 |
| Galv. sheets, No. 28, P'gh | 3.50 | 3.50 | 3.60 | 2.95 |
| Wire nails, Pittsburgh | 1.75 | 1.75 | 1.65 | 1.60 |
| Cut nails, Pittsburgh | **1.70** | 1.60 | 1.60 | 1.60 |
| Fence wire, base, P'gh | 1.60 | 1.60 | 1.50 | 1.40 |
| Barb wire, galv., P'gh | 2.60 | 2.60 | 2.50 | 2.00 |
| **Old Material.** Per Gross Ton: | | | | |
| Iron rails, Chicago | $13.50 | $13.50 | $13.50 | $11.25 |
| Iron rails, Philadelphia | 18.50 | 18.50 | 18.50 | 14.00 |
| Carwheels, Chicago | 12.00 | 12.00 | 11.75 | 10.75 |
| Carwheels, Philadelphia | 14.00 | 14.00 | 14.00 | 10.50 |
| Heavy steel scrap, P'gh | *14.00* | 14.25 | 14.50 | 11.00 |
| Heavy steel scrap, Phila. | 15.00 | 15.00 | 15.00 | 10.25 |
| Heavy steel scrap, Ch'go. | 11.75 | 11.75 | 11.75 | 8.50 |
| No. 1 cast, Pittsburgh | 13.00 | 13.00 | 13.00 | 11.50 |
| No. 1 cast, Philadelphia | 14.00 | 14.00 | 14.00 | 11.50 |
| No. 1 cast, Ch'go (net ton) | 10.50 | 10.50 | 10.00 | 9.00 |
| **Coke, Connellsville.** Per Net Ton at Oven: | | | | |
| Furnace coke, prompt | **$1.75** | $1.70 | $1.50 | $1.60 |
| Furnace coke, future | 2.25 | 2.25 | 1.75 | 1.75 |
| Foundry coke, prompt | 2.15 | 2.15 | 2.00 | 2.00 |
| Foundry coke, future | **2.50** | 2.40 | 2.25 | 2.15 |
| **Metals.** | | | | |
| Per Lb. to Large Buyers: | Cents. | Cents. | Cents. | Cents. |
| Lake copper, New York | 18.00 | 18.00 | 18.00 | 12.00 |
| Electrolytic copper, N. Y. | 18.00 | 18.00 | 17.50 | 11.62½ |
| Spelter, St. Louis | *14.00* | 14.25 | 14.25 | 4.80 |
| Spelter, New York | *14.25* | 14.50 | 14.50 | 4.95 |
| Lead, St. Louis | 4.42½ | 4.42½ | 4.75 | 3.37½ |
| Lead, New York | 4.50 | 4.50 | 4.90 | 3.50 |
| Tin, New York | *32.00* | 33.25 | 33.25 | 30.87½ |
| Antimony, Asiatic, N. Y. | 28.00 | 28.00 | 28.00 | 11.00 |
| Tin plate, 100-lb. box, P'gh | $3.15 | $3.15 | $3.15 | $3.30 |

## Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 73.9c. on plates, structural shapes and sheets and 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal is 56.9c.

**Plates.**—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.40c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

| Extras | Cents per lb. |
|---|---|
| Gages under ¼ in. to and including 3-16 in. | .10 |
| Gages under 3-16 in. to and including No. 8 | .15 |
| Gages under No. 8 to and including No. 9 | .25 |
| Gages under No. 9 to and including No. 10 | .30 |
| Gages under No. 10 to and including No. 12 | .40 |
| Sketches (including straight taper plates), 3 ft. and over | .10 |
| Complete circles, 3 ft. in diameter and over | .20 |
| Boiler and flange steel | .10 |
| "A. B. M. A." and ordinary firebox steel | .20 |
| Still bottom steel | .30 |
| Marine steel | .40 |
| Locomotive firebox steel | .50 |
| Widths over 100 in. up to 110 in., inclusive | .05 |
| Widths over 110 in. up to 115 in., inclusive | .10 |
| Widths over 115 in. up to 120 in., inclusive | .15 |
| Widths over 120 in. up to 125 in., inclusive | .25 |
| Widths over 125 in. up to 130 in., inclusive | .50 |
| Widths over 130 in. | 1.00 |
| Cutting to lengths under 3 ft. to 2 ft., inclusive | .25 |
| Cutting to lengths under 2 ft. to 1 ft., inclusive | .50 |
| Cutting to lengths under 1 ft. | 1.55 |

No charge for cutting rectangular plates to lengths 3 ft. and over.

**Wire Products.**—Prices to jobbers: Fence wire, Nos. 0 to 9, per 100 lb., terms sixty days or 2 per cent discount in ten days, carload lots, annealed, $1.60; galvanized, $2.30. Galvanized barb wire and staples, $2.60; painted, $1.90. Wire nails, $1.75. Galvanized nails, 1 in. and longer, $1.75 advance over base price; shorter than 1 in., $2.25 advance over base price. Woven wire fencing, 69½ per cent off list for carloads, 68½ off for 1000-rod lots, 67½ off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

*Plain Wire, per 100 lb.*

| Nos. | 0 to 9 | 10 | 11 | 12&12½ | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|
| Annealed | $1.65 | $1.70 | $1.75 | $1.80 | $1.90 | $2.00 | $2.10 | $2.20 |
| Galvanized | 2.55 | 2.60 | 2.65 | 2.70 | 2.80 | 2.90 | 3.20 | 3.30 |

**Wire Rods.**—Bessemer, open-hearth and chain rods, $31.

**Structural Material.**—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees 3 in. and over, 1.40c. Extras on other shapes and sizes are as follows:

| | Cents per lb. |
|---|---|
| I-beams over 15 in. | .10 |
| H-beams over 18 in. | .10 |
| Angles over 6 in., on one or both legs | .10 |
| Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909 | .70 |
| Tees, structural sizes (except elevator, handrail, car truck and conductor rail) | .05 |
| Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909 | .20 to .80 |
| Deck beams and bulb angles | .30 |
| Handrail tees | .75 |
| Cutting to lengths under 3 ft. to 2 ft. inclusive | .25 |
| Cutting to lengths, under 2 ft., to 1 ft. inclusive | .50 |
| Cutting to lengths, under 1 ft. | 1.55 |

No charge for cutting to lengths 3 ft. and over.

**Wrought Pipe.**—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from Aug. 16, 1915, all full weight:

*Butt Weld*

| Steel | | | Iron | | |
|---|---|---|---|---|---|
| Inches | Black | Galv. | Inches | Black | Galv. |
| ⅛, ¼ and ⅜ | 72 | 46½ | ⅛ and ¼ | 64 | 37 |
| ½ | 76 | 59½ | ⅜ | 64 | 37 |
| ¾ to 3 | 79 | 63½ | ½ | 68 | 47 |
| | | | ¾ to 2½ | 71 | 52 |

*Lap Weld*

| | | | | | |
|---|---|---|---|---|---|
| 2 | 76 | 60½ | 1¼ | 55 | 36 |
| 2½ to 6 | 78 | 62½ | 1½ | 66 | 47 |
| 7 to 12 | 76 | 58½ | 2 | 67 | 49 |
| 13 and 14 | 62½ | .. | 2½ to 4 | 69 | 52 |
| 15 | 60 | .. | 4½ to 6 | 69 | 52 |
| | | | 7 to 12 | 67 | 50 |

*Reamed and Drifted*

| | | | | | |
|---|---|---|---|---|---|
| 1 to 3, butt | 77 | 61½ | 1 to 1½, butt | 69 | 50 |
| 2, lap | 74 | 58½ | 2, butt | 69 | 50 |
| 2½ to 6, lap | 76 | 60½ | 1¼, lap | 53 | 34 |
| | | | 1½, lap | 64 | 45 |
| | | | 2, lap | 65 | 47 |
| | | | 2½ to 4, lap | 67 | 50 |

*Butt Weld, extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| ⅛, ¼ and ⅜ | 67 | 49½ | ⅜ | 61 | 43 |
| ½ | 72 | 58½ | ½ | 66 | 51 |
| ¾ to 1½ | 76 | 62½ | ¾ to 1½ | 70 | 53 |
| 2 to 3 | 77 | 63½ | 2 and 2½ | 71 | 54 |

*Lap Weld, extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| 2 | 73 | 57½ | 1½ | 65 | 48 |
| 2½ to 4 | 75 | 59½ | 2 | 67 | 49 |
| 4½ to 6 | 74 | 58½ | 2½ to 4 | 69 | 52 |
| 7 to 8 | 68 | 50½ | 4½ to 6 | 68 | 51 |
| 9 to 12 | 63 | 45½ | 7 to 8 | 61 | 44 |
| | | | 9 to 12 | 56 | 39 |

*Butt Weld, double extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| ½ | 62 | 48½ | ½ | 56 | 40 |
| ¾ to 1½ | 65 | 51½ | ¾ to 1½ | 59 | 43 |
| 2 to 2½ | 67 | 53½ | 2 and 2½ | 61 | 45 |

*Lap Weld, double extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| 2 | 63 | 49½ | 2 | 57 | 40 |
| 2½ to 4 | 65 | 51½ | 2½ to 4 | 59 | 45 |
| 4½ to 6 | 64 | 50½ | 4½ to 6 | 58 | 44 |
| 7 to 8 | 58 | 40½ | 7 to 8 | 51 | 33 |

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

**Boiler Tubes.**—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, on lap welded steel tubes, effective from Oct. 1, 1915, and on standard charcoal iron tubes, effective from July 16, 1915, are as follows:

| *Lap Welded Steel* | | *Standard Charcoal Iron* | |
|---|---|---|---|
| 1½ in. | 50 | 1½ in. | 46 |
| 1¾ and 2 in. | 62 | 1¾ and 2 in. | 50 |
| 2¼ in. | 59 | 2¼ in. | 47 |
| 2½ and 2¾ in. | 65 | 2½ and 2¾ in. | 54 |
| 3 and 3½ in. | 70 | 3 and 3½ in. | 58 |
| 3½ to 4½ in. | 71 | 3½ to 4½ in. | 60 |
| 5 and 6 in. | 64 | 5 and 6 in. | 54 |
| 7 to 13 in. | 61 | | |

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

**Sheets.**—Makers' prices for mill shipment on sheets of U. S. Standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms thirty days net, or 2 per cent cash discount in ten days from date of invoice:

*Blue Annealed Sheets*

| | Cents per lb. |
|---|---|
| Nos. 3 to 8 | 1.45 to 1.55 |
| Nos. 9 to 10 | 1.50 to 1.60 |
| Nos. 11 and 12 | 1.55 to 1.65 |
| Nos. 13 and 14 | 1.60 to 1.70 |
| Nos. 15 and 16 | 1.70 to 1.80 |

*Box Annealed Sheets, Cold Rolled*

| | Cents per lb. |
|---|---|
| Nos. 10 and 11 | 1.65 to 1.75 |
| No. 12 | 1.65 to 1.75 |
| Nos. 13 and 14 | 1.70 to 1.80 |
| Nos. 15 and 16 | 1.75 to 1.85 |
| Nos. 17 to 21 | 1.80 to 1.90 |
| Nos. 22 and 24 | 1.85 to 1.95 |
| Nos. 25 and 26 | 1.90 to 2.00 |
| No. 27 | 1.95 to 2.05 |
| No. 28 | 2.00 to 2.10 |
| No. 29 | 2.05 to 2.15 |
| No. 30 | 2.15 to 2.25 |

*Galvanized Sheets of Black Sheet Gage*

| | Cents per lb. |
|---|---|
| Nos. 10 and 11 | 2.50 to 2.65 |
| No. 12 | 2.60 to 2.75 |
| Nos. 13 and 14 | 2.60 to 2.75 |
| Nos. 15 and 16 | 2.70 to 2.85 |
| Nos. 17 to 21 | 2.85 to 3.00 |
| Nos. 22 and 24 | 3.05 to 3.20 |
| Nos. 25 and 26 | 3.20 to 3.35 |
| No. 27 | 3.35 to 3.50 |
| No. 28 | 3.50 to 3.65 |
| No. 29 | 4.25 to 4.40 |
| No. 30 | 4.50 to 4.65 |

## Pittsburgh

PITTSBURGH, PA., Oct. 5, 1915.

Signs of a runaway steel market multiply. The demand for nearly all kinds of steel products is extraordinary. Several of the larger steel companies say they are turning down nearly as much business as they are accepting, being unable to make the deliveries wanted. The demand for war munitions predominates, steel rounds and forging billets being in very heavy demand, with the supply limited as far as Pittsburgh mills are concerned. It is stated that the Youngstown Sheet & Tube Company has recently taken contracts for 100,000 tons or more of war material, but this is not officially confirmed. Bars, plates and shapes are now firm on the 1.40c. basis, all the local mills quoting this price. Some of the lighter products, such as nuts, bolts, steel boiler tubes, etc., have been advanced during the week. Inquiries from the railroads are more numerous, and are especially heavy for spikes for 1916. Mills are very cautious in selling material for delivery into first quarter and first half of 1916, and have instructed selling agents not to accept any such contracts without submitting the offers to the home offices. One local interest has withdrawn all prices on wire products, and another advance in nails and wire is expected. Shafting has been put up $4 per ton and the supply is very limited. The local pig-iron market has been quiet but prices are firm. Scrap is also quiet, but there is a good demand for furnace coke for first half. A higher market on nearly everything is predicted by the first of the year.

**Pig Iron.**—W. P. Snyder & Co. report the average price of Bessemer iron in September to have been $15.906, and of basic, $15, both at Valley furnace. Compared with August, these prices show an advance in Bessemer iron of 84.2c., and in basic of 63.6c. The new demand for Bessemer and basic iron in the past two weeks or more has been quiet, but prices are firm. It is said that foundries have not covered on first quarter and first half iron, and a buying movement is looked for this month or early in November. We note two sales of Bessemer iron of 500 tons each for delivery over the remainder of the year at $16, Valley furnace. We quote: Standard Bessemer iron, $16; basic, $15; malleable Bessemer, $14.50 to $14.75; gray forge, $13.75 to $14, and No. 2 foundry, $14.75 to $15, all at Valley furnace, the freight for delivery in the Cleveland or Pittsburgh district being 95c. per ton.

**Billets and Sheet Bars.**—There is not much doing in either billets or sheet bars, as consumers are well covered, while the steel mills are not actively seeking new business. There is a heavy demand for forging billets, which are selling at about $33 for ordinary carbons and up to $38 and $39 for high carbons. Bessemer or open-hearth billets for prompt shipment are bringing premiums of $1 to $2 per ton. Prices for delivery over the remainder of the year are as follows: Bessemer billets, $24.50; open-hearth billets, $25; Bessemer sheet bars, $25, and open-hearth sheet bars, $25.50, maker's mill, Youngstown or Pittsburgh, prices of steel at the two points being practically the same. We quote forging billets at $33 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take $1 per ton extra. Axle billets are held at $29 to $30.

**Ferroalloys.**—There is a fair amount of new inquiry for ferromanganese, but the demand for ferrosilicon is heavy and prices are higher. English 80 per cent ferromanganese is held at about $100, seaboard, with no guarantees as to deliveries, while domestic is held at $110 to $115 at maker's furnace. Sales of several carloads of prompt domestic ferromanganese are reported at about $110 to $112.50 at furnace. Prices on Bessemer ferrosilicon are higher. We quote 10 per cent at $21; 11 per cent, $22; 12 per cent, $23; 13 per cent, $24.50; 14 per cent, $26.50; 15 per cent, $28.50, and 16 per cent, $31. These prices are f.o.b. furnace, Ashland, Ky., Jackson, Ohio, or New Straitsville, Ohio, each of these points having a freight rate of $2 per gross ton to Pittsburgh. These prices are for delivery over the remainder of this year only. For delivery in first quarter of 1916, 50c. per ton higher is quoted. We quote 20 per cent spiegeleisen at $27 at furnace; ferrotitanium at 8c. per lb. in carloads, 10c. in 2000-lb. lots and over, and 12½c. in smaller lots; ferrovanadium, $2 to $2.25 per lb. of contained vanadium, prices depending somewhat on the size of the order.

**Steel Rails.**—Several large trunk lines have heavy inquiries out for rails for delivery in 1916, and are insisting that the mills reserve rolling space. The railroads realize that the mills are getting filled for some months ahead. The new demand for light rails is active, especially from the coal-mining companies, the Carnegie Steel Company having received new orders and specifications in the past week for over 4000 tons. We quote standard section rails of Bessemer stock at 1.25c., and of open-hearth stock, 1.34c., f.o.b. Pittsburgh. We quote light rails as follows: 25 to 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c.; 8 and 10 lb., 1.40c., in carload or larger lots, 5c. per 100 lb. advance being charged for less than carload lots.

**Structural Material.**—The local market on structural shapes has squarely advanced to 1.40c., with every indication that it will be 1.50c. or higher before the first of the year. The American Bridge Company has taken 1000 tons for extensions to buildings of the Aluminum Ore Company, East St. Louis, Ill., and 3500 tons for an extension of the present open-hearth buildings of the Youngstown Sheet & Tube Company, Youngstown, Ohio, also 810 tons for a coal-handling plant for the Pennsylvania Railroad Company at Baltimore, Md. The McClintic-Marshall Company has taken 200 tons for a State hospital at Farview, Pa., and the Fort Pitt Bridge Works about 200 tons of bridge work for the New York Central Lines. We quote beams and channels up to 15 in. at 1.40c., f.o.b. Pittsburgh, for delivery over the remainder of this year.

**Plates.**—On Wednesday, Oct. 6, the Government opens bids on six torpedo boat destroyers, each taking 300 to 350 tons of plates and shapes. The Western Maryland is reported to have placed an order for 1000 steel hopper cars, and the New York Central is said to be figuring on about 7500 cars in addition to those recently placed. The general demand for plates is heavy, and the mills are well filled for the next two or three months. We quote ¼-in. and heavier tank plates at 1.40c., f.o.b. Pittsburgh.

**Carwheels.**—The New York Central is in the market for steel wheels for 2000 steel hopper cars, half of which are being built by the Pressed Steel Car Company and the other half by the Standard Steel Car Company.

Prices on tender and passenger carwheels have been advanced, but on freight carwheels are unchanged. We now quote 33-in. freight carwheels at $17; 33-in. tender wheels, $20; 36-in. passenger or tender wheels, $24. These prices are based on a 10-in. diameter hub, 50c. extra being charged for an 11-in. diameter hub, all f.o.b. Pittsburgh.

**Sheets.**—The new demand for blue annealed sheets is heavy, and for Bessemer black is more active than for a long time. The demand for galvanized does not show any betterment, and is not more than 25 per cent of mill capacity, if that much. Prices on sheets are firm, most of the large makers quoting 2c. minimum on No. 28 black and 1.60c. on Nos. 9 and 10 blue annealed. Operations among sheet mills are slightly heavier, the American Sheet & Tin Plate Company operating last week to about 75 per cent. We quote No. 28 galvanized sheets at 3.50c. to 3.65c.; No. 28 Bessemer black sheets, 1.90c. to 2c.; Nos. 9 and 10 blue annealed, 1.50c. to 1.60c.; No. 30 black plate, tin-mill sizes, H. R. & A., 1.95c.; No. 28, 1.90c.; Nos. 27, 26 and 25, 1.85c.; Nos. 22 and 24, 1.80c.; Nos. 17 to 21, 1.75c.; Nos. 15 and 16, 1.70c. The above prices are for carload lots, f.o.b. at maker's mill, jobbers charging the usual advance for small lots from store.

**Tin Plate.**—Mills report that specifications are coming in at a fairly good rate, being heavier than usual at this season. It would seem that consumers will take out the full amount called for in their contracts, and in some cases additional purchases have been made. As yet, nothing official has been given out as to the price of tin plate for 1916 delivery, but, with the high prices and scarcity of steel, it is believed it will not be less than $3.50 per base box. The larger mills are running close to capacity, the American Sheet & Tin Plate Company operating to 90 per cent five days per week. Prices are firm, but domestic orders are light and only for small lots for prompt shipment. We quote 14 x 20 coke plates for domestic trade at $3.15 to $3.25 per base box, f.o.b. Pittsburgh, in small lots. There is very little domestic demand.

**Wire Rods.**—It is almost as hard to find any seller of rods as it is of billets. The mills rolling rods need their entire supply for their own use, and rods for the open market can hardly be obtained at any price. Foreign inquiries are fairly active. Canada is in the market for 10,000 to 12,000 tons, but if these are placed in this country, it is not believed they will come from local mills. Prices are higher. We quote Bessemer open-hearth and chain rods at $31 to $32, f.o.b. Pittsburgh.

**Wire Products.**—Domestic demand for wire and wire nails is growing rapidly. All the mills have a great deal of business on their books for domestic and also for foreign shipment. Jobbers and consumers realize that prices on wire products are likely to be higher, and specifications against contracts taken some time ago are very active. The Jones & Laughlin Steel Company has withdrawn all prices on wire and wire nails, and has directed its selling agents to refer all inquiries to the home office. Export inquiry for barb wire is very heavy, and all the local mills have practically their entire output sold up for remainder of this year. For prompt deliveries, premiums of $1 to $2 per ton have been paid on barb wire and other products. Domestic prices to the large trade which, however, are likely to be withdrawn or advanced at any time, are as follows: Wire nails, $1.75; galvanized nails 1 in. and longer taking an advance over this price of $1.75, and shorter than 1 in., $2.25. Plain annealed wire is $1.60; galvanized barb wire and fence staples, $2.60; painted barb wire, $1.90; polished fence staples, $1.90, all f.o.b. Pittsburgh, with freight added to point of delivery, terms sixty days net, less 2 per cent off for cash in ten days. Prices on woven wire fencing are 69½ per cent off list for carload lots, 68½ per cent for 1000-rod lots, and 67½ per cent for small lots, f.o.b. Pittsburgh.

**Skelp.**—While the new demand is dull, prices are slightly higher, due to the constantly advancing market on billets. We now quote grooved steel skelp at 1.40c.; sheared steel skelp, 1.45c.; grooved iron skelp, 1.80c., and sheared iron skelp, 1.90c., delivered to consumers' mills in the Pittsburgh district.

**Railroad Spikes.**—The new demand for railroad spikes in the past two weeks has been active, the railroads realizing that the steel mills are pretty well filled, and that prices on spikes are likely to be higher. For this reason railroads are trying to cover for next year at the old price of $1.50, but makers claim they are not selling beyond this year at that price. The Norfolk & Western has just placed 3000 kegs and the New York Central about 60,000 kegs, of which 30,000 kegs were taken by one local maker, 20,000 by another and 10,000 by a Buffalo interest. Other heavy inquiries are in the market and a good deal of spike business is expected to be closed soon for 1916 delivery. We quote standard sizes of railroad spikes at $1.60 for delivery over remainder of this year, and $1.65 for first quarter; small railroad and boat spikes, $1.70 for prompt delivery and $1.75 per 100 lb. for first quarter.

**Cold-Rolled Strip Steel.**—Most consumers are covered by contracts placed some time ago for the remainder of this year, but the new demand is fairly active and prices are firm. None of the makers is quoting less than $3.10 base, and in some cases slightly higher for prompt delivery. The higher prices on cold-rolled strip steel are due to the heavy advances in raw materials. Export inquiry has quieted down. We quote hard-rolled steel, 1½ in. and wider, under 0.20 carbon, sheared or natural mill edge, per 100 lb., $3.10 delivered. Extras, which are standard among all mills, are as follows:

| Thickness, in. | Extras for thickness | Extras for soft or intermediate tempers | Extras for straightening and cutting to lengths not less than 24 in. |
|---|---|---|---|
| 0.100 and heavier | Base | $0.25 | $0.10 |
| 0.099 to 0.050 | $0.05 | 0.25 | 0.15 |
| 0.049 to 0.035 | 0.20 | 0.25 | 0.15 |
| 0.034 to 0.031 | 0.35 | 0.40 | 0.25 |
| 0.030 to 0.025 | 0.45 | 0.40 | 0.40 |
| 0.024 to 0.020 | 0.55 | 0.40 | 0.50 |
| 0.019 to 0.017 | 0.85 | 0.50 | 1.10 |
| 0.016 to 0.015 | 1.25 | 0.50 | 1.10 |
| 0.014 to 0.013 | 1.95 | 0.50 | 1.25 |
| 0.012 | 2.30 | 0.50 | coils only |
| 0.011 | 2.65 | 0.50 | coils only |
| 0.010 | 3.00 | 0.50 | coils only |

**Rivets.**—The domestic demand for rivets is heavy, while the foreign inquiry is also active. Shipments of rivets to nearly all foreign countries are being made regularly by local makers, who have their product pretty well sold up for the next two or three months. Prices are higher. We now quote buttonhead structural rivets at $1.70 to $1.75, and conehead boiler rivets at $1.80 to $1.85, in carload lots, per 100 lb., f.o.b. Pittsburgh, smaller lots bringing about 10c. advance.

**Hoops and Bands.**—The new demand is strong. Most makers of hoops and bands have their output sold for the remainder of this year, and specifications are very active. Some large inquiries are in the market for first quarter and first half of 1916, and on these the mills are quoting 1.50c. on both hoops and bands. We quote steel hoops at 1.40c. to 1.50c., and steel bands at 1.40c., with extras on the latter as per the steel bar card.

**Iron and Steel Bars.**—The minimum on steel bars is 1.40c., and some sales have been made for delivery in the first quarter of 1916 at 1.45c. Mills are very careful in entering new orders, and in some cases insist that large inquiries be referred to the home office. The demand for steel rounds for shrapnel is still heavy, but local mills are not taking much of this business as they are sold up so far ahead. On some sizes of merchant steel bars local mills are back in deliveries from 8 to 10 weeks. The new demand for iron bars is heavier and prices are higher. We quote steel bars at 1.40c. for delivery over the remainder of this year only; common iron bars, 1.40c.; refined iron bars, 1.50c., and railroad test bars, 1.50c. to 1.55c., all f.o.b. Pittsburgh.

**Shafting.**—Discounts on shafting have been lowered two points, or to 60 per cent off, an advance of about $4 per ton. Makers report that new demand is heavy, premiums being paid for prompt shipment. In shaft-

ing it is not a question now of price but where to get the material. The automobile builders, screw stock concerns and implement makers are all specifying heavily against contracts. Most shafting makers have their output sold for the remainder of this year, and have entered some contracts for first quarter of 1916. We quote cold-rolled shafting at 60 per cent off in carload lots and 55 per cent in less than carloads, f.o.b. Pittsburgh.

**Merchant Steel.**—There is no let-up in the heavy demand and mills are getting back in deliveries. Shipments in October are expected to be heavier than in any one month in more than two years. Prices are firm and likely to be higher in the near future. On small lots we quote: Iron finished tire, ½ x 1½ in. and larger, 1.60c. base; under ½ x 1½ in., 1.75c.; planished tire, 1.80c.; channel tire, ¾ to ⅞ and 1 in., 2.10c. to 2.20c.; 1 x ⅛ in. and larger, 2.20c.; toe calk, 2.20c. to 2.30c., base; flat sleigh shoe, 1.95c.; concave and convex, 2c.; cutter shoe, tapered or bent, 2.50c. to 2.60c.; spring steel, 2.20c. to 2.30c.; machinery steel, smooth finish, 2c.

**Nuts and Bolts.**—Prices have again been advanced on some sizes of nuts and bolts. Makers report orders very heavy and their output sold up for some time ahead. The export demand is active and regular shipments are being made to nearly all foreign countries. Discounts in effect at this writing are as follows: Common carriage bolts, ⅜ x 6 in., and shorter and smaller, rolled thread, 70, 10 & 10; cut thread, 75, 10 & 5; larger or longer, 75 & 5. Machine bolts with h. p. nuts, ⅜ x 4 in., and shorter and smaller, rolled thread, 75 & 5; cut thread, 75, 10 & 5; larger or longer, 75 & 10. Machine bolts with c. p. c. t. and r. nuts, ⅜ x 4 in., and shorter and smaller, 75, 10 & 2½; larger or longer, 70, 10 & 7½. Blank bolts, 75 & 10. Bolt ends with h. p. nuts, 75 & 10; with c. p. c. and t. nuts, 70, 10 & 7½. Lag screws (cone or gimlet point), 80 & 15. Square nuts, h. p., tapped or blank, $6 off list; hexagon, $6.70 off; c. p. c. t. and r. nuts, tapped or blank, square, $5.50 off; hexagon, ⅝ in. and larger, $7 off; smaller, $7.50 off; semi-finished nuts, ⅝ in. and larger, 85 & 10; smaller, 85, 10 & 10. Rivets, smaller than ½ in. in diameter, 80 & 10. All the foregoing prices are f.o.b. Pittsburgh, subject to an actual freight allowance not to exceed 20c. per 100 lb. on shipments of 300 lb. or more.

**Wrought Pipe.**—The Youngstown Sheet & Tube Company is furnishing 52 miles of 16-in. pipe to the East Ohio Gas Company, for a line between Canton and Youngstown, and the Mark Mfg. Company, Chicago, has taken an order for 20 miles of 10-in. screw pipe to go to Wichita, Kan. The general demand for pipe continues dull. Discounts on iron and steel pipe, especially galvanized, are more or less shaded.

**Boiler Tubes.**—Effective Friday, Oct. 1, the makers lowered discounts on steel boiler tubes one point, equal to an advance of $2 per ton. The new demand for locomotive tubes is quite heavy, some large orders having been placed for delivery in last quarter of this year and first quarter of 1916. Discounts now in effect are given on a previous page.

**Coke.**—Negotiations are on with a half dozen or more furnace men for their supply of coke for the first half of 1916. The coke market is suffering from too great a supply, and the wide difference existing in prices on prompt and contract coke is making it difficult for operators to close contracts. Furnace men are not willing to pay $2.25 or higher, not being assured that present prices on pig iron will hold good through the first half of next year. We quote standard makes of blast furnace coke for prompt shipment at $1.75 to $1.85, and on contracts for November and December at $2.25 per net ton at oven. We quote best grades of 72-hr. foundry coke for prompt shipment at $2.15 to $2.25, and on contracts from $2.40 to $2.50, all per net ton at oven. Operators continue to report a scarcity of coal and coke labor. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended Sept. 25 as 388,884 net tons, an increase over the previous week of 6417 tons.

**Old Material.**—The scrap trade continues quiet but prices are firm. Dealers are not trying to force sales, believing that large consumers will soon have to buy scrap and that prices will show betterment. There is still a very active demand for low phosphorus melting stock, this material being used heavily by foundries that are turning out war materials. We note sales of 2000 to 3000 tons of low phosphorus melting stock at about $19.50; 500 tons of borings at about $9.25, and 700 tons of turnings at about $8.50, delivered to consumers' mills in the Pittsburgh district, and 500 tons of selected heavy steel scrap at $13.75 per gross ton, Youngstown. Dealers quote for delivery in the Pittsburgh and nearby districts that take the same rates of freight, as follows, per gross ton:

| | |
|---|---|
| Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery | $14.00 to $14.25 |
| Compressed side and end sheet scrap | 13.00 to 13.25 |
| No. 1 foundry cast | 13.00 to 13.25 |
| Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district | 12.25 to 12.50 |
| Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa. | 14.25 to 14.50 |
| No. 1 railroad malleable stock | 12.25 to 12.50 |
| Railroad grate bars | 8.75 to 9.00 |
| Low phosphorus melting stock | 19.50 |
| Iron car axles | 18.50 to 19.00 |
| Steel car axles | 16.00 to 16.50 |
| Locomotive axles, steel | 19.75 to 20.25 |
| No. 1 busheling scrap | 11.50 |
| No. 2 busheling scrap | 8.00 to 8.25 |
| Machine shop turnings | 8.50 to 8.75 |
| Old carwheels | 13.00 to 13.50 |
| Cast-iron borings | 9.25 to 9.50 |
| *Sheet bar crop ends | 13.50 to 14.00 |
| Old iron rails | 12.75 to 13.00 |
| No. 1 railroad wrought scrap | 13.00 to 13.25 |
| Heavy steel axle turnings | 10.25 to 10.50 |
| Heavy breakable cast scrap | 12.50 to 12.75 |

*Shipping point.

## Chicago

CHICAGO, ILL., Oct. 5, 1915.

Accepting the enormous business in semi-finished steel and bars with which the mills are struggling as an established condition, the particular activity of the week was the continuation of rail negotiations. With five important railroads still in the market for an aggregate of rails expected to be not less than 130,000 tons, rail orders in October seem likely to equal if not exceed the 175,000 tons closed in this market in September. In only one month, May, 1913, were steel shipments larger than those of last month and that by the narrowest of margins. Sales in September exceeded the normal average monthly capacity of the largest mills of this district by 200,000 tons. That nearly all of the mills are now on the 1.40c., Pittsburgh, basis for shapes and bars is accordingly not surprising, and this price is the prevailing one for first half contracts. Some exceptions are noted, particularly where quotations of 1.35c. represent the producer's disinclination to too rapidly advance prices to customers of long standing and where 1.30c. is still done on plates. Nor are all of the mills willing as yet to enter into the campaign for first half business. It is pointed out that much of the present mill congestion is due, not to new sales since July 1, but to the overselling of capacity at that time, a condition augmented to a maximum by the upward course of the market. The further price advances of the week include $1 per ton on blue annealed and black sheets and similar increases for rivets, bolts, hoops and bands. Store prices were advanced $2 per ton for plates, shapes, bars and blue annealed sheets. Conditions in the pig-iron market are relatively a counterpart of the steel situation. With each week additional tonnages of considerable size appear and are quickly placed, largely for first half delivery, although there is apparent a considerable disposition to buy iron for next year's consumption to be delivered this year at a saving of 50c. per ton. That the market does not move upward more rapidly under the influence of such buying as has been done in the past month is the surprising fact, par-

ticularly in view of the limitations upon a further blowing in of idle furnaces.

Pig Iron.—Buying of iron for first half delivery is proceeding at an undiminished rate. Not only does each day bring out new inquiry but the amount of business being placed without inquiry upon solicitation is exceptionally large. Melters of pig iron are to a very great extent placing second orders. Typical sales of the past week include 3000 tons of Northern and Southern iron taken by the Emerson-Brantingham Company, a somewhat smaller amount by the National Sewing Machine Company and about 2500 tons by the American Car & Foundry Company. The inquiries of the Mount Vernon Car Mfg. Company and Fairbanks, Morse & Co., the one for about 2500 tons and the other for half that amount, are indicative of the character of inquiry. The tonnage of either Northern or Southern iron now available for this year's delivery is practically exhausted, and as for the blowing in of the one or two idle furnaces remaining in this district, the limited supply of ore is a serious handicap. Under such conditions as at present obtain with the furnaces, the only question as to prices concerns the length of time before a further advance is made. The furnace price of Southern iron has been advanced to the basis of $12 at Birmingham, but this price leaves little oportunity of making sales in much of Chicago territory. Resale iron at prices approximately equivalent to $11.50 are considerably in evidence. The local price for No. 2 foundry iron continues $14.25, with malleable at $15. The interesting fact is that further advances in prices have not come more rapidly, in view of the general acceptance of the existing basis by buyers as evidenced by their liberal purchases. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. a ton:

| | |
|---|---|
| Lake Superior charcoal, Nos. 2 to 5 | $15.75 to $16.25 |
| Lake Superior charcoal, No. 1 | 16.25 to 16.75 |
| Lake Superior charcoal, No. 6 and Scotch | 16.75 to 17.25 |
| Northern coke foundry, No. 1 | 14.75 to 15.25 |
| Northern coke foundry, No. 2 | 14.25 to 14.75 |
| Northern coke foundry, No. 3 | 14.00 to 14.25 |
| Southern coke, No. 1 f'dry and 1 soft | 16.00 to 16.50 |
| Southern coke, No. 2 f'dry and 2 soft | 15.50 to 16.00 |
| Malleable Bessemer | 15.00 |
| Standard Bessemer | 17.25 |
| Basic | 13.75 to 14.00 |
| Low phosphorus | 24.00 to 24.50 |
| Silvery, 8 per cent | 20.00 to 20.50 |
| Silvery, 10 per cent | 20.50 to 21.00 |

Rails and Track Supplies.—In general, there are under consideration in this market rail inquiries to the aggregate of 70,000 tons. Of these the largest lot is 30,000 tons for the Chicago & Northwestern, for which reservations have been made. The Chicago, Rock Island & Pacific has bought an additional 7500 tons, the Wabash is still in the market, and other roads have negotiations pending. A number of contracts covering spikes and bolts were placed last week, and still others are under consideration, the quantities involved being somewhat under the average and in proportion to rail tonnages. We quote standard railroad spikes at 1.65c. to 1.70c., base; track bolts with square nuts, 2.05c. to 2.10c., base, all in carload lots, Chicago; tie plates, $30, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base, open hearth, 1.34c.; light rails, 25 to 45 lb., 1.16c.; 16 to 20 lb., 1.21c.; 12 lb., 1.26c.; 8 lb., 1.31c.; angle bars, 1.50c., Chicago.

Structural Material.—With the exception of warehouses for an East St. Louis oil company, which will require about 900 tons, there is very little new construction of importance in sight in this territory. Fabricators, however, have considerably increased the tonnage on their books in the last month. Contracts for fabricated steel placed last week contained no large work for this immediate locality, though at St. Paul the St. Paul Foundry Company took 965 tons for a building in that city, and Dyer Brothers were awarded 1215 tons for a bridge in Seattle. The same company also secured about 300 tons for other buildings in that city. The Wisconsin Bridge & Iron Company will furnish 225 tons for a Chicago & Milwaukee Electric Railway bridge. The Iowa City Iron Works will supply 417 tons for a University of Iowa building. The car situation presents nothing new. The consideration of structural tonnage for first quarter delivery has been inaugurated, and, by one mill at least, contracts are being solicited on a basis of 1.40c., Pittsburgh. For this year's shipment 1.35c. can still be done, but few mills are seeking to secure business where it can be had only at that price. We quote for Chicago delivery of structural steel from mill 1.539c. to 1.589c.

Price of structural steel out of store has been advanced $2 per ton, making the quotation 2c. for Chicago delivery.

Plates.—Some of the mills still appear willing to take desirable business at a price as low as 1.30c., Pittsburgh, but a fair tonnage of business has been placed at $1 per ton higher, and some of the mills that have open-hearth steel to offer for suitably prompt deliveries state that they are able to move a considerable tonnage at 1.40c., Pittsburgh. We quote for Chicago delivery of plates from mill 1.489c. to 1.539c.

With the advance of $2 per ton plates out of stock are now quoted at 2c., Chicago.

Sheets.—Blue annealed sheets have been advanced to the basis of 1.60c., Pittsburgh, for No. 10, an increase of $2 per ton, while the price of 2c. for black sheets is being quoted without protection to customers. For special sheets quotations ranging from 2.25c. to 2.35c. are the rule. There has been no material change in the price of galvanized steel. We quote for Chicago delivery from mill, No. 10 blue annealed, 1.889c.; No. 28 black, 2.189c.; No. 28 galvanized, 3.689c. to 3.789c.; heavy gages, 3.439c.

Store prices for blue annealed sheets are up $2 per ton. We quote for Chicago delivery from jobbers' stock as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 2.20c.; No. 28 black, 2.55c.; No. 28 galvanized, 4.35c.

Bars.—Inquiry for large rounds is passing back and forth in this market, with practically no diminution of the tonnages involved, but no contracts of size are known to have been closed in the week under review. Bar-iron tonnage is slightly heavier, and prices are now quite well established at the recent advance. There has begun some buying of iron instead of steel, but, as yet, this alternative has not taken on any great importance. Hard steel bars, especially for reinforcing purposes, are moving with considerable freedom. At the new prices for shafting, the market appears to be unusually firm. We quote mill shipment, Chicago, as follows: Bar iron, 1.35c.; soft steel bars, 1.539c. to 1.589c.; hard steel bars, 1.30c. to 1.35c.; shafting, in carloads, 63 per cent off; less than carloads 58 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 1.90c.; bar iron 1.90c.; reinforcing bars, 1.85c. base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 52 per cent off.

Rivets and Bolts.—Variations in the prices of rivets are still quite marked and, with demand continuing light, seem likely to remain so, at least through the period of existing low-price contracts for rods and bars. The same fact as to raw material also militates against a more uniform adherence to scheduled prices for bolts and nuts, but the recent advance of $2 per ton in wire rods is expected to have an effect. Fall contracting with jobbers for nuts and bolts has been started and a fair business done. We quote as follows: Carriage bolts up to ⅝ x 6 in., rolled thread, 80-10; cut thread, 80-5; larger sizes, 75-5; machine bolts up to ⅝ x 4 in., rolled thread, with hot pressed square nuts, 80-15; cut thread, 80-10; larger sizes, 75-10; gimlet point coach screws, 80-15; hot pressed nuts, square, $6 off per cwt.; hexagon, $7 off per cwt. Structural rivets, ¾ to 1¼ in., 1.75c. to 1.85c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 2c.; boiler rivets, 2.10c.; machine bolts up to ⅝ x 4 in., 75-15; larger sizes, 70-10-10; carriage bolts up to ⅝ x 6 in., 75-10; larger sizes 70-15 off; hot pressed nuts, square, $6, and hexagon, $6.70 off per cwt.

Old Material.—Scrap prices have been so little affected by the developments of the week that opinion as to their upward or downward tendency largely depends

upon individual bias. Some increase in buying is to be noted, some of the rolling mills replenishing their reserves, while a large malleable interest has been a buyer of steel, and shipments of steel grades to Eastern markets have been resumed on a heavier scale. The prices at which some of the railroads, the Chicago & Northwestern and the Santa Fe especially, closed out lists issued during the week were an influence in a certain renewal of confidence. The demand for steel axles which has been maintained consistently for a number of weeks is again a prominent feature, and it is understood that railroad sales of axles were at figures as high as $17. In addition to the scrap lists mentioned above, the Wabash is offering 1500 tons and the Pennsylvania Railroad one of its customary large lists. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

*Per Gross Ton*

| | |
|---|---|
| Old iron rails | $13.50 to $14.00 |
| Relaying rails | 19.50 to 20.50 |
| Old carwheels | 12.00 to 12.25 |
| Old steel rails, rerolling | 13.25 to 13.75 |
| Old steel rails, less than 3 ft | 13.25 to 13.75 |
| Heavy melting steel scrap | 11.75 to 12.00 |
| Frogs, switches and guards, cut apart | 11.75 to 12.00 |
| Shoveling steel | 11.50 to 11.75 |
| Steel axle turnings | 9.75 to 10.00 |

*Per Net Ton*

| | |
|---|---|
| Iron angles and splice bars | $13.75 to $14.00 |
| Iron arch bars and transoms | 13.75 to 14.25 |
| Steel angle bars | 10.75 to 11.25 |
| Iron car axles | 15.50 to 16.00 |
| Steel car axles | 16.50 to 17.00 |
| No. 1 railroad wrought | 11.00 to 11.50 |
| No. 2 railroad wrought | 10.50 to 10.75 |
| Cut forge | 10.50 to 10.75 |
| No. 1 busheling | 9.25 to 9.75 |
| No. 2 busheling | 7.25 to 7.50 |
| Pipes and flues | 8.50 to 9.00 |
| Steel knuckles and couplers | 11.25 to 11.75 |
| Steel springs | 12.25 to 12.75 |
| No. 1 boilers, cut to sheets and rings | 8.50 to 8.75 |
| Boiler punchings | 10.75 to 11.00 |
| Locomotive tires, smooth | 11.00 to 11.50 |
| Machine shop turnings | 7.00 to 7.25 |
| Cast borings | 6.50 to 7.00 |
| No. 1 cast scrap | 10.50 to 11.00 |
| Stove plate and light cast scrap | 8.75 to 9.00 |
| Grate bars | 8.50 to 8.75 |
| Railroad malleable | 10.25 to 10.75 |
| Agricultural malleable | 9.00 to 9.50 |

**Cast-Iron Pipe.**—The American Cast Iron Pipe Company was the successful bidder for 350 tons at Middletown, Ohio. New business on which bids now are being taken includes 146 tons for Hamilton, Ohio, 350 tons for Sidney, Iowa, and 1400 tons for Cincinnati, Ohio. We quote as follows, per net ton. Chicago: Water pipe, 4 in., $27; 6 in. and larger, $25, with $1 extra for Class A water pipe and gas pipe.

**Wire Products.**—Jobbers are specifying against their now very favorable contracts without much urging. Nail business has materially improved. Quotations to jobbers, per 100 lb., are as follows: Plain wire, No. 9 and coarser, base, $1.789; wire nails, $1.939; painted barb wire, $2.089; galvanized barb wire, $2.789; polished staples, $2.089; galvanized staples, $2.789, all Chicago.

## Philadelphia

PHILADELPHIA, PA., Oct. 5, 1915.

The pressure on the mills for both finished and semi-finished steel is such that independence is being shown in a variety of ways by selling representatives. As one of them remarked, they could confine their sales to billets and blooms, but of course they must take care of their finished material trade. Business has been turned down which a short time ago would have been taken with avidity. The quotations for plates, shapes and bars are irregular for the reason that deliveries play an abnormal part in their determination. A mill that is practically out of the market, except on the choicest propositions, can name and often get a premium. Plates appear to be less strong, as a general thing, than shapes and bars. The demand for bars is especially good. The large producers are endeavoring as far as possible to distribute widely their unsold output. The railroads continue to show more interest, and a good inquiry from the Norfolk & Western Railroad calls for 10,000 tons of miscellaneous materials to be used in the construction of gondola cars. The foreign demand for rods, billets, barb wire, etc., continues heavy, as does the domestic and foreign demand for steel rounds. Foundry pig iron is quiet, but the demand for standard low phosphorus is exceptionally strong, and prices are advancing rapidly. Buying of old material is at a standstill, but prices hold fairly firm.

**Pig Iron.**—Standard low phosphorus is far more active than any other grade of pig iron, and some makers have practically disposed of all they can produce this year. Its prices have advanced and now range from $25.50 to $26.50, with sales at the top. Higher prices are predicted. One leading seller booked orders for 10,000 tons in the week and could have sold more had the desired quantities been available. As matters stand, this seller will only quote on small lots for this year's delivery. There has been no activity in basic although the market is not without inquiry for moderate sized lots. Foundry irons show a further tendency toward quiet. It is recognized that the general foundry trade does not begin to share the activity of the steel mills, consequently have no need to buy heavily, as their immediate requirements are covered. A good part of what inquiry there is for foundry grades is for next year, but the higher prices restrain purchasing. For eastern Pennsylvania No. 2 X $15.50, furnace, or $16.29, delivered, can be done without difficulty for this year, while first quarter delivery can be had at $16.50, furnace. Other quotations for this year's delivery of No. 2 X range from $16.50 to $16.89. At the last-named price delivery in the first quarter may be included. A nearby pipe works has not yet closed against its recent inquiry for 15,000 tons. Another company is understood to be looking around for 10,000 tons of pipe iron. The business of the week has consisted of a fair aggregate of moderate sized orders. Shipments are holding up well. September was a good month although the tonnage purchased was not equal to that of August. Quotations for standard brands, delivered in buyers' yards, shipment this year, range about as follows:

| | |
|---|---|
| Eastern Penna., No. 2 X foundry | $16.25 to $16.75 |
| Eastern Penna., No. 2 plain | 16.00 to 16.50 |
| Virginia, No. 2 X foundry | 16.25 to 16.75 |
| Virginia, No. 2 plain | 16.00 to 16.25 |
| Gray forge | 15.25 to 15.50 |
| Basic | 17.00 to 17.50 |
| Standard low phosphorus | 25.50 to 26.50 |

**Iron Ore.**—Arrivals of foreign ore at this port in the week ended Oct. 2 aggregated 5300 tons from Cuba. The ore business with Europe is at a standstill because of the impossibility of securing ocean bottoms. Ship owners find it far more profitable to rush their vessels in ballast back to this port to take on east-bound freight at high rates rather than to devote time to take on ore from Sweden, Spain or Mediterranean ports. The situation is one which promises to grow more acute, rather than easier.

**Ferroalloys.**—English 50 per cent ferromanganese continues to be quoted at $100, seaboard, deliveries to be made at some time in the future as permitted by arrivals. Last week 390 tons arrived here. More liberal imports are promised for this month and early November. Prompt deliveries in small lots are quoted at $110 to $115. It is understood that an eastern Pennsylvania steel company has purchased 250 tons of domestic ferromanganese for October, November and December delivery at $105, delivered. Ferrosilicon is quoted at $71 to $73, Pittsburgh, according to quantity.

**Bars.**—Orders for steel bars are very heavy; in fact, some offices here are doing the best business in the memory of their managers. It is probable that 1.35c., Pittsburgh, can be done on a desirable proposition, but some of the mills are asking up to 1.45c., Pittsburgh, or 1.60c., Philadelphia. In some cases orders cannot be accepted by branch offices until confirmed by the mill. The demand for large rounds, which is responsible to a considerable extent for the shortage of steel, goes on apace. An inquiry from Wilmington calls for 33,000 tons, and the Baldwin Locomotive Works is inquiring for a round lot. Iron bars are strong at 1.509c., Philadelphia, with the mills not eager to take business at this price.

Plates.—With one of the leading makers sold up to the end of the year, the demand continues active. As far as can be learned, none of the mills has opened its books for 1916. The Eastern mill referred to quotes 1.45c., Pittsburgh base, or 1.609c., Philadelphia, as its minimum for delivery in six to ten weeks, but in other directions 1.509c. and 1.559c., Philadelphia, can be had. Altogether plates are unquestionably easier than bars or shapes. The Norfolk & Western Railroad has issued an inquiry for material needed in the construction of 1000 90-ton all-steel gondola freight cars, which will take 9000 tons of plates. Other materials required are 6000 tons of shapes, 2000 tons of steel bars, 750 tons of iron bars and 6000 M. C. B. axles. It is reported that a contract for the construction of a 450-ft. freight vessel for the Spanish American Iron Company, Philadelphia, has been received by the Maryland Steel Company. The vessel will be used in the ore trade between Cuba and Baltimore.

Structural Material.—It is estimated that propositions now pending throughout the East aggregate 150,000 to 200,000 tons. Bids will be opened Oct. 19 in this city for 25,000 tons required by the Frankford elevated railroad. Bids are in on the Philadelphia & Reading bridge at Sunbury, Pa. The Pennsylvania Railroad has closed against some small bridges. The mills have sufficient business to keep them busy to the end of the year but are making no 1916 contracts. The minimum of some sellers is 1.559c., Philadelphia, but the proposition must be attractive. Others ask 1.609c., Philadelphia. For material out of stock 1.759c., Philadelphia, has been obtained. The contract for over 300 tons of steel for a garage of the New Jersey Automobile & Supply Company, Camden, N. J., Joshua C. Jefferis, architect and engineer, has been awarded to Robert B. Lederle, Philadelphia.

Sheets.—Consumers are actively in the market for fourth quarter deliveries and asking for contracts for the following quarter. For No. 10 blue annealed the leading Eastern maker is asking 1.809c., Philadelphia.

Billets.—Eastern Pennsylvania mills have but few billets to sell. The minimum quotation for open-hearth rolling billets is $30 and forging billets range from $36 to $42, according to specifications. On some special analysis rerolling billets the nominal quotation is $45.

Rails.—The Baltimore & Ohio Railroad is expected to place an order for 10,000 to 15,000 tons this week with the Pennsylvania Steel Company. The New York, New Haven & Hartford is inquiring for 15,000 tons and the Boston & Maine for 25,000 tons.

Coke.—The last business reported in furnace coke was for 1916 delivery at $2.25 to $2.35 per net ton at oven, but producers are hoping to get $2.50 for next year where a flat price is made. Many of the negotiations are on a sliding scale basis. Prompt furnace is quoted at $1.75 to $1.80, at oven, and contract at $2 to $2.25. Prompt foundry is quoted at $2.30 to $2.60 per net ton at oven, and contract at $2.40 to $2.70. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Old Material.—The market is quiet but it cannot be said that prices have receded except in the case of wrought pipe. For heavy melting steel more than $15 could not be obtained. Dealers are of the belief that there is no cause for worry on their part in view of the consumption. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to $1.35 per gross ton, are as follows:

| | |
|---|---|
| No. 1 heavy melting steel | $15.00 |
| Old steel rails, rerolling | $15.50 to 16.00 |
| Low phos. heavy melting steel scrap | 20.50 to 20.75 |
| Old steel axles | 19.50 to 20.50 |
| Old iron axles (nominal) | 22.00 to 23.00 |
| Old iron rails | 18.50 to 19.00 |
| Old carwheels | 14.00 to 14.50 |
| No. 1 railroad wrought | 16.50 to 17.00 |
| Wrought-iron pipe | 13.50 to 14.00 |
| No. 1 forge fire | 11.00 to 11.50 |
| Bundled sheets | 11.00 to 11.50 |
| No. 2 busheling | 9.50 to 10.00 |
| Machine shop turnings | 10.25 to 10.50 |
| Cast borings | 10.50 to 10.75 |
| No. 1 cast | 14.00 to 14.50 |
| Grate bars, railroad | 10.50 to 11.00 |
| Stove plate | 10.50 to 11.00 |
| Railroad malleable | 10.50 to 11.00 |

## Cincinnati

CINCINNATI, OHIO, Oct. 6, 1915.—(*By Wire.*)

Pig Iron.—Basic consumers are feeling the market for next year's supply and there is a definite inquiry from a southern Ohio mill for 2000 tons for first quarter. On account of the Eastern movement of basic from the Ironton district the furnaces there are encouraged to advance prices and $15, Ironton, is now considered minimum for first half. Foundry and malleable irons are also held at the same figure. Southern producers have generally marked up their quotations to $12, Birmingham basis, for any shipment this year, but some resale iron can be bought below this figure. The amount of spot shipment business being transacted is not sufficient to warrant a change in previous quotations. The inquiry for foundry iron outside of Cincinnati shows some improvement, but labor troubles in a number of local machine shops tend to hold back purchases in this immediate territory, although recent first half sales include three lots aggregating 2000 tons. Among other sales reported are 800 tons of Northern No. 2 foundry iron to a southern Ohio melter at $15, Ironton, for first half and about 1000 tons of Northern foundry to an Indiana melter at the same price for first quarter. A northern Ohio consumer has bought 1500 tons of basic to be shipped from a Lake furnace within the next 30 days. A sale in this territory of 500 tons of Virginia iron for first half is also reported. The Ohio silvery irons are not very active, but quotations are firm and it is doubtful if $18 at furnace can be shaded even for nearby shipment. An Indiana buyer has contracted for 1000 tons of malleable for first half, which is the only nearby sale of note reported. It is the general opinion of iron merchants here that a buying movement for first half will be inaugurated before the close of this month. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

| | |
|---|---|
| Southern coke, No. 1 f'dry and 1 soft | $14.90 to $15.40 |
| Southern coke, No. 2 f'dry and 2 soft | 14.40 to 14.90 |
| Southern coke, No. 3 foundry | 13.90 to 14.40 |
| Southern No. 4 foundry | 13.40 to 13.90 |
| Southern gray forge | 12.90 to 13.40 |
| Ohio silvery, 8 per cent silicon | 19.26 |
| Southern Ohio coke, No. 1 | 16.76 to 17.01 |
| Southern Ohio coke, No. 2 | 15.76 to 16.01 |
| Southern Ohio coke, No. 3 | 15.51 to 15.76 |
| Southern Ohio malleable Bessemer | 15.76 to 16.01 |
| Basic, Northern | 15.76 to 16.01 |
| Lake Superior charcoal | 16.20 to 17.20 |
| Standard Southern carwheel | 26.90 to 27.40 |

(*By Mail*)

Coke.—Considerable furnace coke business is under negotiation, but producers and consumers have not yet been able to get together on prices. Prompt Connellsville furnace coke is quoted at $1.75 to $1.85 per net ton at oven and contract prices range from $2 to $2.25. Prompt foundry coke is quoted around $2.40 to $2.60 at oven, and contract about 10c. per ton higher. Wise County and Pocahontas oven operators are unwilling to take on any spot furnace coke business below $2 and their contract price is about $2.25, while in some instances as high as $2.40 is quoted for first half. Foundry coke in the two districts mentioned ranges from $2.40 to $2.75 at oven, the latter price representing what most producers are asking for future shipment.

Finished Material.—It is stated that jobbers' stocks are running low and there does not seem to be much of a tendency to buy any large amount of galvanized sheets at present. The heavy demand for the larger sizes of steel bars has affected the sheet bar supply, so that it is predicted that the mills may run behind on deliveries later on, although this contingency has not yet arisen. The local warehouses are quoting No. 28 galvanized sheets around 4.35c. and No. 28 black at 2.55c. to 2.60c. The mill quotations named by nearby mills are around 3.75c., Pittsburgh, for No. 28 galvanized sheets and 2c. for No. 28 black sheets. Steel bars are firm at 1.40c., Pittsburgh basis, and the local warehouse price is 1.90c., and on small structural shapes 2c.

Old Material.—A few small advances have been made on several grades of scrap and the market is somewhat firmer. With the exception of the stove

foundries, all consumers of scrap in this territory are melting a larger tonnage than usual. This applies especially to the rolling mills. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

*Per Gross Ton*

| | | |
|---|---|---|
| Bundled sheet scrap | $8.75 to | $9.25 |
| Old iron rails | 12.25 to | 12.75 |
| Relaying rails, 50 lb. and up | 20.25 to | 20.75 |
| Rerolling steel rails | 11.00 to | 11.50 |
| Heavy melting steel scrap | 10.50 to | 11.00 |
| Steel rails for melting | 10.50 to | 11.00 |

*Per Net Ton*

| | | |
|---|---|---|
| No. 1 railroad wrought | $9.50 to | $10.00 |
| Cast borings | 6.50 to | 7.00 |
| Steel turnings | 5.75 to | 6.25 |
| Railroad cast scrap | 10.25 to | 10.75 |
| No. 1 machinery cast scrap | 11.50 to | 12.00 |
| Burnt scrap | 7.50 to | 8.00 |
| Old iron axles | 15.25 to | 15.75 |
| Locomotive tires (smooth inside) | 9.75 to | 10.25 |
| Pipes and flues | 7.25 to | 7.75 |
| Malleable and steel scrap | 8.50 to | 9.00 |
| Railroad tank and steel scrap | 6.50 to | 7.00 |

## Buffalo

BUFFALO, N. Y., Oct. 5, 1915.

**Pig Iron.**—September shipment from furnaces was very large, exceeding in total any month for a long period; most furnaces shipped out more than their monthly production and stocks are nearly exhausted. Furnaces are deluged with inquiry and the price situation has strengthened materially, the week showing a sharp advance on all grades of approximately 50c. per ton. The minimum for current and first quarter delivery is now $15.50 at furnace, with a range to $17 for 4 to 5 per cent silicon, No. 1 foundry being held at $16.50 and No. 2 X foundry and malleable at $16. One producer asks $16, at furnace, for any grade for the remainder of 1915 delivery. Railroad jobbing foundries are becoming busier from day to day and are commencing to come into the market with increasingly large tonnages. It is reported that a large amount of Bessemer iron has been booked by a Buffalo producing interest for export to France. We quote as follows for current and first quarter 1916 delivery, f.o.b. furnace, Buffalo:

| | |
|---|---|
| Foundry of 4 to 5 per cent silicon | $17.00 |
| No. 1 foundry | $16.25 to 16.50 |
| No. 2 X foundry | 15.50 to 16.00 |
| No. 2 plain | 15.50 to 15.75 |
| No. 3 foundry | 15.50 |
| Gray forge | 15.50 |
| Malleable | 16.00 |
| Bessemer | 16.00 to 16.50 |
| Basic | 16.00 to 16.50 |
| Charcoal—regular brands and analysis | 16.75 to 17.75 |
| Charcoal—special brands and analysis | 20.00 to 21.00 |

**Finished Iron and Steel.**—September specifications of bars, plates and shapes are understood to have been practically in full. New business is being offered in the way of contracts through the first quarter of next year and some offers made to buy through the first half, but it is understood that selling agencies are restricting contracts to regular customers and are limiting them to the first quarter. Prices are climbing; the 1.40c., Pittsburgh, price has not yet been withdrawn by sellers, although there will be a further advance in the near future. Some of the agencies are asking and obtaining 1.50c. for less than carload orders. The pressure for delivery is the vital question rather than the price. Warehouse prices have been advanced $2 per ton, to 2.05c. for bars and small shapes and 2.10c. for structural shapes and plates, with 5c. additional for delivery to customer. Mill prices for steel bands are up to $1 per ton and steel hoops and black and blue annealed sheets have advanced $2 per ton. Large sizes of bolts have this week advanced, to equalize the recent 5 per cent advance on small sizes, owing to the advance in bar prices. Railroad spikes have also been advanced 10c. per keg. A portion of the 17,000 tons of open-hearth steel rails just placed by the New Haven Railroad went to a Buffalo producing interest. The American Bridge Company has 450 tons for additional factory buildings for the Eastman Kodak Company, Rochester, and 800 tons steel for addition to the Statler Hotel, Detroit. Contract for the 2200 tons of structural steel for rebuilding the Chicago Street viaduct, this city, has been awarded to the Strobel Construction Company, Chicago.

**Old Material.**—Shipments on contracts are going forward in good volume, although weakness is apparent in several items of the list, particularly in machine shop turnings, which have declined 50c. per ton. The principal local user of heavy melting steel is not at present an active buyer. In consequence shipments of this commodity are moving principally to the Pittsburgh district. Another factor causing slower conditions is that dealers are experiencing a considerable number of rejections, indicating that consumers are receiving larger tonnages than they can take care of. Old steel axles are very scarce and have advanced 50c. per ton. Old carwheels show good demand, and the price has been advanced slightly. We quote dealers' asking prices per gross ton, f.o.b., Buffalo, as follows:

| | |
|---|---|
| Heavy melting steel | $13.00 to $13.50 |
| Boiler plate, sheared | 13.00 to 13.50 |
| Low phosphorus steel | 17.50 to 18.00 |
| No. 1 railroad wrought scrap | 12.50 to 13.00 |
| No. 1 railroad and machinery cast | 12.50 to 13.00 |
| Old steel axles | 18.50 to 19.00 |
| Old iron axles | 19.00 to 19.50 |
| Old carwheels | 12.75 to 13.25 |
| Railroad malleable | 12.50 to 13.00 |
| Machine shop turnings | 6.50 to 7.00 |
| Heavy axle turnings | 9.00 to 9.50 |
| Clean cast borings | 7.50 to 7.75 |
| Old iron rails | 15.50 to 16.00 |
| Locomotive grate bars | 9.50 to 10.00 |
| Stove plate (net ton) | 8.50 to 9.00 |
| Wrought pipe | 10.50 to 11.00 |
| Bundled sheet scrap | 9.50 to 10.00 |
| No. 1 busheling scrap | 10.00 to 10.50 |
| No. 2 busheling scrap | 8.50 to 9.00 |
| Bundled tin scrap | 10.00 |

## Cleveland

CLEVELAND, OHIO, Oct. 5, 1915.

**Iron Ore.**—Any furnace interests which plan to blow in their idle stacks and have not yet contracted for their supply of ore will have difficulty in securing shipment of ore this season. At present not a boat is available, as all the lake carriers not tied up with ore contracts have been diverted to the grain trade. Grain rates have advanced sharply and cargoes are now being taken at 6c., which is equivalent to more than $2 per ton for ore. With favorable weather conditions there is a possibility that some of the ore carriers may get their contracts cleaned up in time to bring down additional ore at the end of the season. At present there seems to be no prospects of the easing up of the vessel situation. Shippers are willing to take orders for ore without any guarantee that they will make deliveries this season. A few furnace companies yet to purchase for idle furnaces have been feeling the market but no definite inquiries are reported from this source. Some speculative inquiry has developed from furnace interests wishing to buy additional ore; they have expressed a willingness to have shipments from the mines deferred until next spring, if boats cannot be secured this year. Shippers are unwilling to take contracts on that basis, especially in view of the expected advance in ore prices next season. Some consumers are apparently expecting to be able to purchase some unsold ore on the docks, if their supply runs out before next spring, but it is believed they will be disappointed, as there is very little unsold ore on the docks. Ore shipments in September were 7,863,146 gross tons, a gain of 2,431,839 tons over the same month of a year ago. Shipments for the season until Oct. 1 were 34,699,566, an increase of 7,960,158 tons over the same period in 1914. September shipments slowed up late in the month owing to the withdrawal of boats to carry grain. But the movement was a record breaking one for September. We quote prices as follows, delivered to the lower lake ports: Old Range Bessemer, $3.85; Mesaba Bessemer, $3.45; Old Range non-Bessemer, $3; Mesaba non-Bessemer, $2.80.

**Pig Iron.**—The market is quiet but very firm. Foundry iron sales and inquiries are limited to small lots and there are no new inquiries for steel-making iron. Local furnaces are adhering to the $15 price for

No. 2 foundry. At Toledo No. 2 foundry is quoted at $14.50 for the last quarter and $15 for the first half. Southern iron is firm at $12, Birmingham, for No. 2 for delivery until Jan. 1 and $12.50 for the first quarter. However, some resale iron can still be had for prompt shipment at $11.50. Prices on Ohio silvery iron have advanced to $18 for 8 per cent silicon for the last quarter and $18.50 for the first half. The demand for Bessemer ferrosilicon is unusually heavy. We quote delivered Cleveland, as follows:

| | |
|---|---|
| Bessemer | $16.95 |
| Basic | 15.80 |
| Northern No. 2 foundry | 15.30 |
| Southern No. 2 foundry | $15.50 to 16.50 |
| Gray forge | 14.80 |
| Jackson Co. silvery 8 per cent silicon | 19.62 to 20.12 |
| Standard low phos. Valley furnace | 23.50 to 24.00 |

Coke.—The market is inactive but firm. Prices on furnace coke are higher. Makers are asking $1.85 to $2 for standard Connellsville foundry coke for prompt shipment and about $2.25 for the first quarter contracts. Standard foundry coke is held at $2.25 and $2.50 for prompt shipment and $2.50 to $2.75 for contracts.

Finished Iron and Steel.—New demand is heavy both in specifications on contracts and current orders, and bar consumers are beginning to complain considerably of the slowness in deliveries. Some of the independent mills have opened their books for the first-quarter contracts and have booked considerable tonnage for that delivery at 1.40c., Pittsburgh, for steel bars, plates and construction material. The bar situation is tighter and 1.50c. is being paid for small lots for early shipment. Some of the mills are oversold for the last quarter and are going slow in taking contracts for next year. Fearing a possibility of not being able to secure deliveries railroads are coming in the market for steel requirements for repair work for the first half and some railroad business has been placed for that delivery in the form of actual orders. Some spike business has been taken at $1.65 for the first quarter. The Nickel Plate railroad has an inquiry out for from 2500 to 5000 tons of rails. The demand for sheets is quite active. Prices on blue and black annealed sheets are very firm, most of the mills asking 2c., at mill, for No. 28 black and 1.60c. for No. 10 blue annealed. Galvanized sheets are quoted at 3.50c. to 3.60c. for No. 28. The structural situation is rather quiet, no contracts for round tonnages being reported. Iron bars are quiet with the price unchanged at 1.50c., Cleveland. Warehouse prices have been advanced to 2c. for steel bars and 2.10c. for plates and structural material. Considerable advance over the regular prices is charged for steel rounds larger than 2 in.

Bolts, Nuts and Rivets.—Prices have been further advanced 5 per cent on large sized bolts, owing to the high price of large round bars. The demand is heavy. Rivet makers have advanced prices to 1.90c., Pittsburg, for structural rivets and 2c. for boiler rivets. It is said that most of the mills are adhering to these prices. Plants have their output well sold up for the remainder of the year, most of the orders being taken at the low prices. Export demand is fairly active. Among the new sales is a 250-ton lot for shipment to Greece. Bolt and nut discounts are as follows: Common carriage bolts, ⅜ x 6 in., smaller or shorter, rolled thread, 75, 10 and 10 per cent; cut thread, 75, 10 and 5; larger or longer, 70, 10 and 10; machine bolts with h. p. nuts ⅜ x 4 in., smaller or shorter, rolled thread, 75, 10, 10 and 5; cut thread, 75, 10 and 10 per cent; larger and longer, 75 and 5; coach and lag screws, 80 and 15; square h. p. nuts, blank or tapped, $5.80 off the list; hexagon h. p. blank or tapped, $6.30 off; c.p.c. and t. square nuts, blank or tapped, $5.30 off; hexagon ⅝ in. and larger, $6.75 off; 9/16 in. and smaller, $7.25 off; cold pressed semi-finished hexagon nuts ⅝ in. and larger, 85 off; smaller, 85 and 10.

Old Material.—The market is fairly active and firm. Mills are buying freely in excess of their needs and are holding back on shipments. Prices on heavy steel scrap are about 25c. a ton higher. Local mills are offered $12.75 to $13 for heavy melting steel and Youngstown prices have advanced to $14 and $14.25. Steel axles have again advanced owing to the demand for shipment to Italy and $20 is now being offered for axles for export. We quote f.o.b., Cleveland, as follows:

| *Per Gross Ton* | |
|---|---|
| Old steel rails | $13.00 to $13.50 |
| Old iron rails | 14.00 to 14.50 |
| Steel car axles | 19.00 to 20.00 |
| Heavy melting steel | 12.75 to 13.00 |
| Old carwheels | 11.75 to 12.00 |
| Relaying rails, 50 lb. and over | 22.50 |
| Agricultural malleable | 10.00 to 10.25 |
| Railroad malleable | 13.00 to 13.50 |
| Steel axle turnings | 10.00 |
| Light bundled sheet scrap | 11.00 to 11.25 |

| *Per Net Ton* | |
|---|---|
| Iron car axles | $17.25 to $17.75 |
| Cast borings | 7.00 to 7.25 |
| Iron and steel turnings and drillings | 6.25 to 6.50 |
| No. 1 busheling | 9.50 to 10.00 |
| No. 1 railroad wrought | 11.50 to 12.00 |
| No. 1 cast | 11.00 to 11.50 |
| Railroad grate bars | 9.00 |
| Stove plate | 9.25 to 9.50 |

## Birmingham

BIRMINGHAM, ALA., Oct. 4, 1915.

Pig Iron.—In addition to being well or fully sold up for the remainder of 1915, with small stocks on hand and heavy outgo, free contracting into the first quarter of 1916 at $12.50 has added to the strength of the position of Southern furnace men. The feature of the week was the sale of 1000 tons of No. 3 spot for export at $12, the equivalent of $12.50 for No. 2. Of the 75,000 tons of warrant iron in Alabama yards at least 40,000 tons belongs to two large Southern consumers with branch plants elsewhere. That iron will not figure in resale business. Birmingham operators are at a loss to understand where $11.50 resale iron is coming from, claiming that it is not on record in this State, where, on the contrary, such iron has sold at $12. During the week one interest booked for 1916 shipment 5000 tons in 1000 to 300 ton lots for Southern delivery, another 7000 tons for Southern, Cincinnati and St. Louis territory, and a third an equal amount for Northern and Southern consumers. No spot sales under $12 are recorded, except for regular customers. The largest foundry-iron operator has advanced to $13 for 1916 after well covering the first quarter and has made a few sales at that figure. The quotation of $12.50 for 1916 is now practically reserved for regular customers on the part of the two largest foundry-iron producers, with neither seeking business at that figure. The leading interest has nothing under $13.50 to offer for any delivery. In fact, it has no stocks of any kind worth the mention besides being well covered through the first quarter. September sales were the equivalent of the make of two four-active-stack operators and of one two-active-furnace operator. The outgo is reported as heavy all round. No new stacks have been added to the active list, but two are ready for the torch. Steel mills are overrun with orders. Large foundries are busy on heavy castings for local furnaces, Cuba and Porto Rico and some Eastern points. With the available supply running rapidly to a low ebb, and a tendency to further advances, we quote, per gross ton, f.o.b. Birmingham furnaces, as follows:

| | |
|---|---|
| No. 1 foundry and soft | $12.50 to $13.00 |
| No. 2 foundry and soft | 12.00 to 12.50 |
| No. 3 | 11.50 to 12.00 |
| No. 4 | 11.25 to 11.75 |
| Gray forge | 11.00 to 11.50 |
| Basic | 12.00 to 12.50 |
| Charcoal | 21.00 to 21.50 |

Cast-Iron Pipe.—While new orders have not featured the gas and water pipe trades, they are moving along with a satisfactory production. The coming of winter foreshadows a decrease in business. There has been some export movement of sanitary pipe, one shipment going to London and others to South American points. As a rule, however, these shops are only running to 50 per cent of capacity, some being idle. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., $22; 6-in. and upward, $20, with $1 added for gas pipe.

Coal and Coke.—Coal is slowly responding to the withdrawal of furnace operators from the general market, the increased takings by the more active rail-

roads and the resuming of operations at cotton seed oil mills, compresses and the like. Some small mines report a return to six-day operations. Railroads still hold off putting into effect the raise in freight rates to New Orleans. The Alabama carriers have likewise been enjoined from putting into effect advanced rates on raw materials to furnaces in the Birmingham district. The coke output is well taken care of without further rise in price. Southern and Southwestern foundries are increasing their orders for foundry makes. We quote, per net, ton, f.o.b. oven, as follows: Beehive foundry, $3 to $3.25, with some makes at $3.50; beehive furnace, $2.75 to $3; by-product furnace, $2.50 to $2.75; by-product foundry, $2.75 to $3.

**Old Material.**—The scrap market continues brisk, with a steady demand for steel and light cast and stove plate. The demand exceeds the supply. Prices are firm. We quote, per gross ton, f.o.b. dealers' yards, as follows:

| | |
|---|---|
| Old iron axles | $13.50 to $14.00 |
| Old steel axles | 13.00 to 13.50 |
| Old iron rails | 12.50 to 13.00 |
| No. 1 railroad wrought | 9.50 to 10.00 |
| No. 2 railroad wrought | 8.50 to 9.00 |
| No. 1 country wrought | 8.50 to 9.00 |
| No. 1 machinery cast | 9.50 to 10.00 |
| No. 1 steel scrap | 9.50 to 10.00 |
| Tram carwheels | 9.50 to 10.00 |
| Stove plate | 8.00 to 8.50 |

## St. Louis

ST. LOUIS, MO., Oct. 4, 1915.

**Pig Iron.**—Free buying continues, though furnace representatives, after casting up their totals for September, rather expected something of a slowing up for a time. September with one representative was the best month but one in the history of his office. Sales have run in lots below 1000 tons each, with none for delivery beyond the first quarter and most for the last quarter. Some furnaces are sold up for the last quarter. Included in the sales of the week have been one of 1000 tons of carwheel iron for 1915 delivery, 2000 tons of malleable for delivery into 1916 and a number of purchases by stove foundries aggregating probably 6000 tons in all.

**Coke.**—Buying is only on special requirements or of special brands, with prices on the Connellsville basis. Specifications on contracts are increasing and insistence on delivery is becoming more urgent. By-product coke is quoted on the Connellsville basis, but the local supply dominates the market through competitive concessions.

**Finished Iron and Steel.**—There has been marked increase in business in the finished products, both in the aggregate volume and the size of individual orders. Fabricators report more business in sight and are insisting on higher prices. A building in Tulsa, a theater in St. Louis and an oil company's structure in Illinois are the largest jobs let during the week, averaging about 500 tons each. In standard section steel rails a large purchase is expected from a road now in receivers' hands, while one sale of 500 tons was made to a small road. Light rails are in active demand from the coal interests. Concessions are made in large transactions of plates. Deliveries are becoming more extended about ten weeks being the best promised at present. Track fastenings are in good demand for the season. Movement out of warehouse is active at increased prices. We quote for stock out of warehouse as follows: Soft steel bars, 1.95c.; iron bars, 1.80c.; tank plates, 2.05c.; structural material, 2.05c.; No. 10 blue annealed sheets, 2.35c.; No. 28 black sheets, cold rolled, one pass, 2.55c.; No. 28 galvanized sheets, black sheet gage, 4.20c., but subject to variations in the spelter market.

**Old Material.**—There is increased demand for shipment north and east, while steel axles are becoming very scarce with the demand sharp for shipment east and for export. The local industries are buying only for special requirements, but these are becoming more varied, and general buying is expected to develop before long. Cast scrap is especially strong, and the same is true of rolling grades. For shipment east No. 1 and No. 2 wrought, heavy steel scrap and heavy shoveling steel are also in demand. Lists out include one of 500 tons from the Vandalia, 2200 tons from the Missouri Pacific, 8000 tons from the Baltimore & Ohio and 1500 tons from the Wabash, all of them closing the present week, with others to come. We quote dealers' prices f.o.b. customers' works, St. Louis industrial district, as follows:

*Per Gross Ton*

| | |
|---|---|
| Old iron rails | $11.75 to $12.25 |
| Old steel rails, rerolling | 12.50 to 13.00 |
| Old steel rails, less than 3 ft. | 12.50 to 13.00 |
| Relaying rails, standard section, subject to inspection | 21.00 to 23.00 |
| Old carwheels | 10.50 to 11.00 |
| No. 1 railroad heavy melting steel scrap | 11.50 to 12.00 |
| Heavy shoveling steel | 10.50 to 10.75 |
| Frogs, switches and guards cut apart | 11.50 to 12.00 |
| Bundled sheet scrap | 7.50 to 8.00 |

*Per Net Ton*

| | |
|---|---|
| Iron angle bars | $11.75 to $12.00 |
| Steel angle bars | 10.00 to 10.50 |
| Iron car axles | 15.75 to 16.25 |
| Steel car axles | 14.75 to 15.25 |
| Wrought arch bars and transoms | 13.75 to 14.25 |
| No. 1 railroad wrought | 10.25 to 10.50 |
| No. 2 railroad wrought | 9.75 to 10.25 |
| Railroad springs | 11.25 to 11.75 |
| Steel couplers and knuckles | 11.00 to 11.50 |
| Locomotive tires, 42 in. and over, smooth inside | 12.00 to 12.25 |
| No. 1 dealers' forge | 9.25 to 9.50 |
| Mixed borings | 6.00 to 6.50 |
| No. 1 busheling | 9.00 to 9.50 |
| No. 1 boilers, cut to sheets and rings | 7.50 to 8.00 |
| No. 1 railroad cast scrap | 10.50 to 10.75 |
| Stove plate and light cast scrap | 8.50 to 8.75 |
| Railroad malleable | 8.75 to 9.00 |
| Agricultural malleable | 7.75 to 8.00 |
| Pipes and flues | 7.25 to 7.75 |
| Railroad sheet and tank scrap | 7.00 to 7.25 |
| Railroad grate bars | 7.00 to 7.50 |
| Machine shop turnings | 7.00 to 7.50 |

## San Francisco

SAN FRANCISCO, CAL., Sept. 28, 1915.

Distributive business continues far from normal, but the last few weeks have brought a slight and gradual improvement. Some of the largest consumers, those in a position to buy direct from mills, have been placing contracts covering their requirements up to next spring; and there has been a quite general disposition to specify the full tonnage taken on third quarter contracts, at least in the heavier lines. The tonnage taken by merchants, however, is not heavy. Export inquiries continue numerous.

**Wire Products.**—Considerable interest has been taken in recent cable inquiries from Petrograd in this market for barb wire, but apparently neither merchants nor mill agents were in a position to accept the business. There has been quite a healthy demand in local territory for barb and plain wire, fencing, etc., and nails show some improvement.

**Bars.**—Local mills are getting a substantial tonnage of foreign business, and some improvement is also noted in local demand. There is not much activity in the jobbing trade, but the placing of a number of contracts for extended delivery gives the market an appearance of activity. A very fair tonnage of reinforcing bars is coming out, for the most part on small orders. There is more talk of advancing prices, but local mills are apparently still anxious for business, and 1.75c. is the generally quoted price on carloads from mill, this being far below the present Pittsburgh basis.

**Structural Material.**—Building appears to be picking up a little, and while the number of class A contracts is limited, there is a good deal of tentative inquiry. It is reported that Dyer Brothers, this city, will fabricate the steel for a bascule bridge at Seattle, Wash., amounting to over 2000 tons, and a contract for a similar bridge is to be let shortly. It is understood that the Golden Gate Iron Works will get the contract for a theater building at Eleventh and Franklin streets, Oakland, and plans are about ready for the Archon Building at Fourteenth and Franklin streets, Oakland. Some of the local shops are figuring on a barracks job at Mare Island.

**Rails.**—A few orders for light rails have been placed and a large lot that has been held here for some time has been disposed of. There is not much new in-

quiry at the moment, but business is expected on a number of small logging roads, and specifications are to come out in a few months for the road in connection with the Hetch-Hetchy water system, about 58 miles.

Plates.—New orders keep up in good shape, especially for marine work. It is announced that the Seattle Construction & Drydock Company has a new contract for a large steamer, and the Craig Shipbuilding Company at Long Beach, the Union Iron Works, this city, and the Mare Island Navy Yard are all well occupied, with additional business in prospect. The Western Pipe & Steel Company has taken a good-sized riveted pipe contract for the Oakdale Irrigation District in this State.

Sheets.—The local market on galvanized sheets has broken badly, owing to arbitrary price cutting and the resulting dissatisfaction, together with the uncertainty of mill prices, discourages buying on the part of merchants. The consuming demand for corrugated has increased materially, but is hardly as heavy as usual at this season. In other lines the movement is light.

Wrought Pipe.—An easy feeling is noted in mill quotations here, with close competition for orders of even moderate importance. Country business is picking up a little, but is not active. The smaller sizes of galvanized are extremely dull, though there are some prospects of improvement in the plumbing department.

Cast-Iron Pipe.—Little new business has been placed, small orders for 4 and 6 in. having come from Tehama and Anaheim, Cal. Glendale, Cal., is taking figures on about 125 tons. A good many municipal projects are being planned, but definite inquiries are slow to appear. Prices have again advanced, being quoted at Pacific coast terminals at $31 per net ton for 6-in., $33 for 4-in., and $1 extra for class A and gas pipe.

Pig Iron.—Foundry trade has picked up considerably, and while there are still a good many scattered lots of imported iron in dealers' and melters' hands, attention is turning more than ever to domestic brands. There has been a heavier movement than for some time. Several melters have placed contracts extending through next spring, and one of the leading railroads has made a large purchase of Southern iron. Steel manufacturers in British Columbia have also placed good-sized orders with local agents for Southern furnaces. Most of the local foundries, however, are keeping pretty close to requirements, considering the outlook uncertain. No. 1 Southern foundry iron is quoted here at $22.50 to $23 per gross ton.

Ferroalloys.—Consumers report some difficulty in getting ferromanganese, deliveries from England being slow. Woods, Huddart & Gunn, local agents, report a large sale of English ferromanganese. The Noble Electric Steel Company, Heroult, Cal., is about to start a furnace on ferrochrome, and the production of ferromanganese at this plant, which has been temporarily interrupted, will be resumed shortly.

Coke.—The movement of coke to the foundries has been a little more active than the last few weeks, but there is no telling how long it will continue, and most purchases have been small. Foreign coke in the yards is still held at $14 per net ton. Domestic coke appears to be gaining ground, and there is a fairly steady movement from the South and West Virginia at $14 to $15.25 per net ton.

Old Material.—The general scrap market is picking up to some extent. Increasing activity at local rolling mills has brought a better demand for steel melting scrap, and some dealers are holding for extreme prices, though there is still plenty of material available at $7 to $9 per gross ton. Cast scrap stands as before at $14 to $15 per net ton, but there is little more movement.

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Richard P. Harvey, Western representative of the Blaw Steel Construction Company, Pittsburgh, Pa., manufacturer of steel forms for concrete construction, has established an office at 225-227 Monadnock Building, San Francisco.

## New York

NEW YORK, Oct. 6, 1915.

**Pig Iron.**—While not active, the foundry pig-iron market is strong. In the Buffalo district one seller that has been naming lower prices than others has now come up, and little No. 2 iron is to be had below $15.50 at Buffalo furnace for this year. Some further tonnage of Bessemer iron has been negotiated through Buffalo for shipment abroad. In addition to 3500 tons sold to Italy ten days ago, 6000 tons is now under inquiry for France, $16.50 at Buffalo furnace being asked. Ocean freights have advanced further, and as high as $18 has been asked on pig iron to France. It is understood that 10,000 tons more of Bessemer iron is wanted by French interests. One consumer of foundry iron, whose product is soil pipe, is in the market for 2000 to 4000 tons for plants at Newark and in New York State, shipment to be in the first quarter and first half of 1916. A sale of 500 tons of malleable iron has been made in Connecticut for this year's delivery. At Buffalo one furnace company that is heavily sold for this year is asking more for fourth quarter than for first quarter—$16 and $15.50, respectively for No. 2 X. Generally producers are asking more for next year's iron than for prompt. A good many foundries have iron enough bought to carry them into next year, and at figures $2 to $3 a ton below what furnaces are now asking. As pig-iron output grows, such consumers are not disposed to go in heavily for next year's iron. On the other hand, the furnaces, with output pretty well sold for this year, are not crowding sales. A spot sale of 1000 tons of No. 2 soft Southern iron on warrants held in New York is reported at $12.25 Birmingham. We quote at tidewater as follows for fourth quarter delivery: No. 1 foundry, $16.50 to $16.75; No. 2 X, $16.25 to $16.50; No. 2 plain, $15.75 to $16; Southern iron, $16.50 to $17 for No. 1 and $16.25 to $16.50 for No. 2.

**Ferroalloys.**—The situation is unchanged. Prospects for at least as good shipments of British ferromanganese in October as in September are strengthened by the advices of one representative here to the effect that shipments already booked are not less than for the first week in September. Sales of small lots of the British alloy continue to be made at $100, seaboard, subject to the usual restrictions, but they are almost entirely to regular customers. The receipts also are to be distributed on old contracts almost exclusively. Domestic makers are reported to be selling at $105, delivered, but not in large quantities. The absence of anxiety by consumers is still an occasion for comment. Ferrosilicon, 50 per cent, continues active for both domestic and foreign consumption. Reports of an advance from the quotations of $71 to $73, Pittsburgh, are not improbable in view of the large demand.

**Structural Material.**—Fresh inquiries of some size from railroads and further offerings for early bidding for fabricated work for New York City transportation lines encourage a market which in general building propositions has for a long time not had enough to go around. Fabricating prices are accordingly still low. Structural mills remain exceedingly busy and it is rather widely held that considerable of their products is being consumed West, though shipbuilding has been a large factor. It is coming also to be widely believed that the aggregate of material going into industrial plant expansions to take care of war business is greater than generally apprehended. Along with other forms of finished steel, prices are strong with 1.40c., Pittsburgh, as a minimum. Deliveries are six to eight and sometimes ten weeks, the smaller sizes being the more difficult to obtain. The new railroad offerings include about 3000 tons for the Long Island, 1200 tons for the Central Railroad of New Jersey, 1500 tons for a union station, Macon, Ga., 3000 tons for the Seaboard and 400 tons for the Pennsylvania. The new work in New York City will call for over 60,000 tons and is for the New York Municipal Railways, for construction on the Brooklyn Rapid Transit lines. In other respects new offerings are generally of relatively small tonnage and include two theaters, one in Jersey City and one in New York, about 700 tons each, but it is understood

that an Appraiser's storehouse is up in Boston, involving 2500 tons. The closures of the week embrace the following: 900 tons for E. W. Bliss Company, Brooklyn, to the Hedden Iron Construction Company; 800 tons for the Schuyler Square apartment to the Passaic Structural Steel Company; 700 tons for piershed, Thirty-fifth Street, Brooklyn, to Post & McCord; 700 tons for the McMorrow apartment, Ninety-ninth Street and West End Avenue, to the Hinkle Iron Company, which it is understood has sublet the fabrication to Milliken Brothers, Inc., which concern has taken 100 tons for San Domingo. It may be noted that Dyer Brothers, San Francisco, have taken a bridge at Thirteenth Street, Seattle, Wash., totaling 1200 tons. We quote mill shipments at 1.40c., Pittsburgh, or 1.569c., New York. Warehouse prices have advanced $1 per ton and for small lots from store we quote 2.10c. to 2.15c., New York.

**Plates.**—The usual minimum quotation is 1.45c., Pittsburgh, and this is easily obtained because deliveries can be made sometimes in less than three weeks from Eastern mills against much more belated deliveries from Pittsburgh companies which quote at 1.40c. There is, perhaps, a little greater demand for plates for repairing ships. Some holders of contracts have specified heavily. Export prices appear to be minimum of 1.45c., Pittsburgh. Worth Brothers have taken the 10,000 tons of plates for different navy yards. We quote mill shipments of plates at 1.40c. to 1.45c., Pittsburgh, or 1.569c. to 1.619c., New York. Plates from store are 2.10c. to 2.15c., New York.

**Iron and Steel Bars.**—Somewhat of a lull has followed an active period of two weeks toward the end of last quarter when exceedingly large bookings were made on account of war contracts and by distributors. The result is that little steel bar business can be placed this year and in some cases deliveries are extended more than three months. Perhaps the chief outstanding feature is the active inquiries of manufacturing consumers to get covered for the first half of 1916, and it is expected also that by the end of the month mills will be fully booked for the first half operations on bars for shell making. Export prices are strong, figuring back to 1.45c. and 1.50c., Pittsburgh. It is not believed that much of the large round bars for shell production will go for less than 3c. per lb. Much stress is being put on the desirability of checking the upward price tendency as much as possible, but it is expected that premiums will be offered frequently and that 2c. per lb. for ordinary size bars, for even large lots is likely before long if relatively prompt shipments can be made. Some railroads have already bought out of warehouse because the extended condition of deliveries from mills was not appreciated, and it is partly because of the general situation that store prices have again advanced. We quote mill shipments of steel bars norminally at 1.40c., Pittsburgh, or 1.569c., New York, and refined iron bars, 1.519c., New York. Out of store in New York iron and steel bars are 2.05c. to 2.10c.

**Cast-Iron Pipe.**—The only public letting of importance in this vicinity is that of the city of New York, which opens bids on Thursday, Oct. 7, for about 385 tons, most 12-in. Private buying continues excellent for the season. The Warren Foundry & Machine Company, Phillipsburg, N. J., has had some labor trouble, but it was not important and the plant is running as usual. Prices are firm. Carload lots of 6-in., class B and heavier, are quoted at $24.50 to $25 per net ton, tidewater, class A and gas pipe taking an extra of $1 per ton.

**Old Material.**—A decided lull in the demand and an abundant supply in consumers' yards and under control of dealers have caused an appearance of weakness in the scrap market. This, however, is only manifested in the admitted inability to secure the top quotations made in the past three or four weeks. Holders are maintaining their ground, believing that the heavy consumption of scrap must cause consumers to re-enter the market in the near future. As far as can be ascertained, no transactions of consequence occurred in this market the past week either in steel scrap or rolling-mill stock. Brokers are paying about as follows to local dealers and producers, per gross ton, New York:

| | |
|---|---|
| Old girder and T rails for melting | $12.25 to $12.50 |
| Heavy melting steel scrap | 12.25 to 12.50 |
| Relaying rails | 19.50 to 20.00 |
| Rerolling rails | 13.00 to 13.50 |
| Iron car axles | 22.00 to 22.50 |
| Steel car axles | 17.50 to 18.00 |
| No. 1 railroad wrought | 14.00 to 14.50 |
| Wrought-iron track scrap | 13.00 to 13.50 |
| No. 1 yard wrought, long | 12.75 to 13.00 |
| No. 1 yard wrought, short | 12.25 to 12.50 |
| Light iron (nominal) | 4.00 to 4.25 |
| Cast borings | 7.75 to 8.00 |
| Wrought turnings | 7.75 to 8.00 |
| Wrought pipe | 11.00 to 11.50 |

Foundries have also bought very little, their operations still continuing somewhat below normal. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

| | |
|---|---|
| Old carwheels | $12.00 to $12.25 |
| No. 1 cast (machinery) | 12.75 to 13.00 |
| No. 2 cast (heavy) | 11.75 to 12.00 |
| Stove plate | 9.75 to 10.00 |
| Locomotive grate bars | 9.50 to 10.00 |
| Malleable cast (railroad) | 10.00 to 10.50 |

## British Market Higher

### Hematite Iron Is Advancing—Rail Purchases by India and Australia

(*By Cable*)

LONDON, ENGLAND, Oct. 6, 1915.

The pig-iron market is dull and the demand for phosphoric iron is poor. September Cleveland pig-iron shipments were only 39,000 tons. Hematite iron is firm at 102s. or higher, owing to the increased cost of ore and rising freights, but demands for consumption are still withheld. Special grades are up to 125s., with a great shortage in prospect next year, owing to steel shell requirements still uncovered. Tin plates are firmer at 17s. 6d. Home trade buying is distinctly good. Sentiment is affected by British American export arrangements.

India has bought 10,000 tons of rails from Guest, Keen & Nettlefolds, Ltd., at £8 15s. The Broken Hill Proprietary Company is reported to have booked 33,000 tons of rails for Australia. Finished steel is firm, with works full of government orders and labor scarce. Semi-finished steel is quiet. Furnaces in blast are 162 against 159 at the same time last year. Stocks of pig iron in Connal's stores were 139,677 tons at the close of last week, as compared with 140,524 tons one week previous. We quote as follows:

Tin plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 17s. 6d., against against 17s. 3d. last week.

Cleveland pig-iron warrants, 64s. 7d., against 64s. 1½d. last week.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 64s. 9d., compared with 64s. 3d. a week ago.

Steel black sheets, No. 28, export, f.o.b Liverpool, £11 15s.

Steel ship plates, Scotch, delivered local yards, £10.

Steel rails, export, f.o.b. works port, £8 17s. 6d.

Hematite pig iron, f.o.b. Tees, 99s., as compared with 95s. 6d. a week ago.

Sheet bars (Welsh), delivered at works in Swansea Valley, £7 5s.

Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £11.

Steel bars, export, f.o.b. Clyde, £12 5s.

Ferromanganese, f.o.b., £20 15s.

Ferrosilicon, 50 per cent, c.i.f. £19 10s.

### Large Orders for Shrapnel Bars—The Ferromanganese Enterprise in India

(*By Mail*)

LONDON, ENG., Sept. 21, 1915.—The pig-iron market has been full of disappointment for the furnace owners, who had been expecting sufficient expansion in general buying to warrant them in raising their prices. There has been more life in the consuming trades and export business has improved, but nothing in intrinsic conditions justifies any broad upward movement. Speculative business in Cleveland warrants is at a very low ebb and the market is exceedingly dull.

Fluctuations in prices have been very limited and any revival in speculative buying can hardly be looked for as long as outside conditions are so unsatisfactory. An improved business has been done in hematite with Sheffield consumers and Continental buyers, Italy being particularly prominent. Here, as in foundry iron, talk of prices advancing considerably is heard. The Spanish ore trade is firmer and freights are very high, with few boats available, but the tendency of coke prices is downward.

There is nothing illuminating regarding semi-finished steel. A general reluctance to sell on the part of American works is manifest and some of the independent makers appear to be full up for export for the rest of the year. Very recently Americans have been trying to sell one or two lots of billets for prompt shipment, and though business has not yet resulted, no doubt some deals will be closed. The Welsh makers are decidedly easier, for they are feeling now in full force the restriction of their output, entailed by the miserable position of the tin-plate and galvanized sheet industries.

The finished steel market presents no new feature, makers being engaged on old orders and disinclined to worry themselves about new business, because pressed severely to give deliveries of munition material. Selling prices show considerable irregularity as far as merchant descriptions are concerned and the quoting of close prices is practically impossible.

Some huge orders have been given out for shrapnel bars, the total within the last few days reported to exceed 1,000,000 tons, shared between most of the makers.

There is no fresh movement in ferromanganese, but a new development is the enterprise of the Tata Iron & Steel Company of Sakchi, India, which has put a furnace into operation on this alloy, using Indian ores. India may develop into an exporter, though the quantity available will not be of very much importance at present.

# Metal Market

NEW YORK, Oct. 6, 1915.

## The Week's Prices

Cents Per Pound for Early Delivery

| | Copper, New York | | | Lead | | Spelter | |
|---|---|---|---|---|---|---|---|
| | | Electro- | Tin, | New | St. | New | St. |
| Sept. | Lake | lytic | New York | York | Louis | York | Louis |
| 29 | 18.00 | 18.00 | 33.00 | 4.50 | 4.42½ | 14.25 | 14.00 |
| 30 | 18.00 | 18.00 | 32.37½ | 4.50 | 4.45 | 14.50 | 14.25 |
| Oct. | | | | | | | |
| 1 | 18.00 | 18.00 | 32.25 | 4.50 | 4.45 | 14.50 | 14.25 |
| 2 | 18.00 | 18.00 | ..... | 4.50 | 4.42½ | 14.50 | 14.25 |
| 4 | 18.00 | 18.00 | 32.00 | 4.50 | 4.42½ | 14.25 | 14.00 |
| 5 | 18.00 | 18.00 | 32.00 | 4.50 | 4.42½ | 14.25 | 14.00 |

The general copper market is quiet though the larger sellers have made some important sales; meanwhile prices are sustained. Tin is dull and lower. Lead is quiet but steady. Business in spelter has been erratic, and it has a weaker tendency. Antimony continues quiet at unchanged prices.

## New York

**Copper.**—Further large sales were made on both foreign and domestic account last week. An impression is current that reports of these sales have been exaggerated, but this feeling is undoubtedly due to the fact that only a few large sellers participated in the business. There was a sale yesterday of 1,000,000 lb. of Lake on the basis of 18c., cash. Both Lake and electrolytic are firm at the same level, namely, 18c., though electrolytic also has been quoted at 18.12½c. and 18.25c., cash, New York. The domestic business done was with munitions makers, and indirectly for export. The fact that electrolytic has been quoted higher than Lake has occasioned some comment, but the circumstance is regarded as natural in view of the fact that many consumers have been taught in recent months that electrolytic answers their purpose quite as well as Lake, even in cartridge manufacture. A further factor in bringing about the change is that there is no difficulty in getting all the first-class electrolytic that may be desired, whereas the favored brands of Lake have at times been out of the market. Of course, high grade Lake will always be used in the manufacture of the higher grades of cartridges, because its greater penetrability by the hammer-pin of a rifle insures a discharge. Where millions of cartridges are concerned, however, a slight variation from the certainty of the cartridge made from Lake copper can be overlooked. The exports in September totaled only 14,327 tons.

**Copper Averages.**—The average price of Lake copper for the month of September, based on daily quotations in THE IRON AGE, was 17.97c., and of electrolytic, 17.69c.

**Tin.**—Except for some rather active dealing in spot on Monday, and transactions yesterday involving between 200 and 300 tons of various positions, the tin market has been extremely quiet and prices have declined. The quotation for spot yesterday was 32c. The Straits quotation declined £1 10s. in London yesterday, but this market did not follow for a peculiar reason. From some source came a rumor that the British Government was contemplating an export duty of 10 per cent. on tin similar to the 2½ per cent. export duty it recently placed on rubber, and though this report had no confirmation it served to sustain the market. Interested parties immediately cabled for definite information, but up to this time have received no reply. The deliveries in September were good, amounting to 4300 tons, making the total since January 1, 1915, 35,675 tons, which is 2175 tons in excess of the deliveries in the same period of 1914. In stock and landing at the beginning of the month was 4546 tons. There is afloat today 5235 tons.

**Lead.**—The domestic market has been dull. London has shown greater activity than New York, and on Oct. 1 went to £24 2s. 6 d., an advance of 7s. 6d. over the previous quotation, all of which was caused by heavy Russian buying abroad. It is understood that large quantities were sought for shipment to Archangel before the close of navigation. The New York market was strengthened by the London situation, but softened on Oct. 4 when the London price dropped to £23 12s. 6d. and again yesterday when it came down to £23 8s. 9d. The New York price yesterday was steady at 4.50c., while the St. Louis quotation was 4.42½c. The exports in September totaled 2628 tons.

**Spelter.**—There have been flurries of demand for prompt deliveries which caused the price in the week to go to 14.50c., New York, and 14.25c., St. Louis, but yesterday the quotations were 14.25c., New York, and 14c., St. Louis. November deliveries are quoted at 13.50c. and December at 13c. The exports in September totaled 4914 tons.

**Antimony.**—This metal is quiet and nominally quoted at 28c. to 28.25c., duty paid, for Chinese and Japanese grades.

**Old Metals.**—The market is firm. Dealers' selling prices are as follows:

| | Cents per lb. |
|---|---|
| Copper, heavy and crucible | 16.75 to 17.00 |
| Copper, heavy and wire | 16.25 to 16.50 |
| Copper, light and bottoms | 14.50 to 15.00 |
| Brass, heavy | 11.75 to 12.00 |
| Brass, light | 10.00 to 10.25 |
| Heavy machine composition | 13.00 to 13.50 |
| No. 1 yellow rod brass turnings | 13.00 to 13.50 |
| No. 1 red brass or composition turnings | 11.50 to 12.00 |
| Lead, heavy | 4.25 |
| Lead, tea | 4.00 |
| Zinc scrap | 10.50 to 11.00 |

## St. Louis

Oct. 4.—Non-ferrous metals, especially the Missouri product, have been somewhat stronger the past week, with better buying. Lead is quoted at 4.45c. to 4.50c.; spelter, 14.50c. to 14.75c.; tin, 34c.; Lake copper, 18.25c.; electrolytic copper, 18.25c.; Asiatic antimony, 29c. to 30c. In the Joplin ore market prices generally were stronger and higher. Zinc blende commanded a range of $80 to $87.50 per ton for 60 per cent, with the top price for premium ores $90. Calamine ranged from $45 to $60 for 40 per cent, the choicest reaching $65. Lead ore also advanced sharply as a result of the increased demand for the metal, commanding $55 for 80 per cent. Miscellaneous scrap metals are quoted as follows: Light brass, 6.50c.; heavy yellow brass,

8.50c.; heavy red brass and light copper, 10c.; heavy copper and copper wire, 12c.; lead, 3.50c.; zinc, 6.50c.; pewter, 20c.; tinfoil, 28c.; tea lead, 3.50c.

### Chicago

OCT. 4—Activity in the metal market has been largely confined to transactions in copper, and prices evidence the stronger situation in a slight advance. The lead market also has shown a degree of firmness. We quote: Casting copper, 17.75c.; Lake copper, 18.25c.; tin, carloads, 32.50c.; small lots, 34.50c.; lead, 4.50c. to 4.55c.; spelter, nominally, 14.50c.; sheet zinc, nominally, 16c.; Cookson's antimony, 47.50c. to 50c.; other grades, 30c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 14c.; copper bottoms, 12.50c.; copper clips, 13.50c.; red brass, 11.25c.; yellow brass, 10c.; lead pipe, 3.75c.; zinc, 9c.; pewter, No. 1, 18c.; tinfoil, 25c.; block tin pipe, 28c.

## Iron and Industrial Stocks

NEW YORK, Oct. 6, 1915.

More high records in industrial stocks have been made in the past week. Speculation in the war munition stocks has gone to such an extreme that banking interests and brokerage houses are issuing warnings of a possible collapse, which may prove disastrous to those who are indulging in the present furious gamble. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

| | | | |
|---|---|---|---|
| Allis-Chal., com. | 43 - 49⅛ | Pitts. Steel, pref. | 95 |
| Allis-Chal., pref. | 72½ - 77 | Pressed Stl., com. | 68¾ - 78¼ |
| Am. Can, com. | 62⅝ - 68½ | Ry. Steel Spring, com. | 46¼ - 54 |
| Am. Can, pref. | 106 -108¾ | Ry. Steel Spring, pref. | 94 - 95 |
| Am. Car & Fdy., com. | 79 - 98 | Republic, com. | 49½ - 55⅞ |
| Am. Car & Fdy., pref. | 115 -116⅜ | Republic, pref. | 102½-104 |
| Am. Loco., com. | 66¼ - 74½ | Rumely Co., com. | 3¾ - 6⅝ |
| Am. Loco., pref. | 99 -100 | Rumely Co., pref. | 7¼ - 12¾ |
| Am. Stl. Fdries. | 58¼ - 67 | Sloss, com. | 56¾ - 65 |
| Bald. Loco., com. | 112 -140 | Sloss, pref. | 90⅞ - 91 |
| Bald. Loco., pref. | 110½-114 | Pipe, com. | 23 - 30½ |
| Beth. Steel, com. | 350 -400½ | Pipe, pref. | 45½ - 49¾ |
| Beth. Steel, pref. | 155 -164 | U. S. Steel, com. | 76⅞ - 81¾ |
| Case (J. I.), pref. | 80 | U. S. Steel, pref. | 114 -115 |
| Colorado Fuel | 56 - 63¾ | Va. I. C. & Coke. | 60 - 69 |
| Deere & Co., pref. | 97 | West'gh'se Elec. | 121¾-141¼ |
| General Electric. | 173 -185¼ | Am. Ship, com. | 37 - 37½ |
| Gt. No. Ore Cert. | 45½ - 50½ | Am. Ship, pref. | 74 - 74¾ |
| Int. Harv. of N. J., com. | 106 -107¼ | Chic. Pneu. Tool. | 79¾ - 86 |
| Int. Harv. of N. J., pref. | 117 | Cambria Steel | 66¼ - 70 |
| Int. Harv. Corp., com. | 70 | Lake Sup. Corp. | 8⅞ - 10 |
| Lackawanna Stl. | 81¼ - 94¾ | Pa. Steel, pref. | 85 - 96 |
| Nat. Enam. & Stm., com. | 29 - 32½ | Warwick | 10¼ - 10⅞ |
| Nat. Enam. & Stm., pref. | 89 - 92 | Cruc. Steel, com. | 95½-109¾ |
| | | Cruc. Steel, pref. | 108 -112½ |
| | | La Belle Iron, com. | 44 - 46½ |
| | | La Belle Iron, pref. | 114 -115 |

### Dividends

The General Railway Signal Company, regular quarterly, 1½ per cent on the common and preferred stocks, both payable Oct. 1.

The Union Switch & Signal Company, regular quarterly, $1.50 per share on the common and preferred stocks, payable Oct. 15.

The New Jersey Zinc Company, extra, 2 per cent, payable Oct. 11. The regular rate on the new capitalization is 2½ per cent a quarter. Action on the regular dividend, however, is not due until next month.

The Chicago Pneumatic Tool Company, regular quarterly, 1 per cent, payable Oct. 25.

The Westinghouse Air Brake Company, regular quarterly, $2 per share, payable Oct. 30.

The Pittsburgh Gage & Supply Company, regular quarterly, 1½ per cent.

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The American International High Commission on uniformity of laws relating to trade and finance had planned to hold a meeting at Buenos Aires Nov. 1. In the past week it was decided at a meeting at Washington attended by Secretary McAdoo, John Bassett Moore and other members of the commission to postpone this South American meeting until April 3, 1916. It was decided that the original date would not give sufficient time for preparing the data on existing obstacles to better trade and financial relations among the American republics, with suggestions for their elimination.

## Cleveland Iron and Steel Meeting

The program for the meeting of the American Iron and Steel Institute at Cleveland, Ohio, Friday and Saturday, Oct. 22 and 23, is announced by Secretary James T. McCleary as follows:

Address by the President, Elbert H. Gary.

Cleveland and Its Industries. Name of author, a Cleveland member, to be announced later.

Electric Furnace for Heating Billets, Castings, etc. By Thaddeus F. Baily, president Electric Furnace Company of America, Alliance, Ohio.

Modern Methods of Burning Blast Furnace Gas in Stoves and Boilers. By Ambrose N. Diehl, superintendent blast furnaces of Carnegie Steel Company at Duquesne, Pa.

The Development of Alloy Steel for Commercial Purposes. By Edgar D. Rogers, general sales manager United Steel Company, Canton, Ohio.

Under-Advertising of the Steel Business. By George H. Jones, vice-president Inland Steel Company, Chicago.

Recent Developments in Sintering of Iron Ores. By Bethune G. Klugh, engineer American Ore Reclamation Company, New York.

Casting Steel Ingots. By Henry M. Howe, emeritus professor of metallurgy, Columbia University, New York.

Moving Pictures (evening). National Tube Company and American Steel & Wire Company.

The Cleveland committee is preparing for plant trips and various forms of entertainment for the members on Saturday following the regular meeting day. From New York two official trains have been designated, leaving for Cleveland on Thursday afternoon, Oct. 2. One is New York Central train No. 21, leaving at 6.45 p. m. and arriving at Cleveland at 7.35 a. m. Friday. The other is Pennsylvania Railroad train No. 23, leaving at 5.04 p. m., reaching Cleveland at 7.30 a. m.

## Crucible Steel Company's Earnings

The Crucible Steel Company of America recently filed a report with the New York Stock Exchange when it applied for the listing of the remaining common stock in the treasury. This report covers eleven months ended July 31, 1915. It shows net earnings for that period of $1,968,657. If August earnings were up to current estimates, the total for the twelve months should be in excess of $2,500,000. To pay the full 7 per cent on the preferred stock requires $1,750,000. The company's undivided surplus at that time was $9,352,431. The balance sheet as of July 31, 1915, shows raw material and manufactured products inventoried at $6,855,631; bills receivable and accounts receivable, $4,369,254; cash, $2,016,734. The liabilities included the scrip dividend issued June 30, 1910, due June 30, 1920, at 3 per cent interest, $1,956,533; bills and accounts payable, etc., $6,674,690; reserve funds for plant renewals, etc., $1,220,280.

## Germany's Steel Output in July

Germany's largest monthly output of steel since the war began was attained in July, 1,138,478 metric tons against 1,080,786 tons in June. In July, 1914, the total production was 1,644,648 tons. The July output this year was distributed as follows: Bessemer steel ingots, 576,977 tons; open-hearth steel ingots, 479,169 tons; steel castings, 61,731 tons; crucible steel, 8555 and electric steel, 12,046 tons. The Rhine-Westphalian district furnished 657,146 tons of the total. The electric steel output exceeds the crucible by nearly 3500 tons. Production to Aug. 1, 1915, was 7,283,959 tons against 11,015,676 tons to Aug. 1, 1914.

## Eliminating Piping in Steel Ingots

Benjamin Talbot of Middlesbrough, England, has taken out a patent (U. S. 1,150,401—Aug. 17, 1915) on treating iron and steel ingots to eliminate piping. It is supplementary to previous patents Nos. 1,055,831, 1,055,832 and 1,055,833, which covered the production of solid ingots by squeezing part or all of the ingot while the center was still fluid, after the ingot had been removed from the mold and placed in a soaking pit, until the skin of the upper portion was sufficiently soft to be compressed without cracking.

In the new invention a composite mold is employed,

the upper part of which is made of a refractory material which is a slower conductor of heat than the metal part of the mold. The mold is stripped and the upper part of the ingot squeezed or reduced in area so as almost completely to close the cavity or pipe, thus eliminating the necessity of first placing it in a soaking pit for reheating. The vertical faces of the upper portion of the metal are said to be at a sufficiently high temperature for compression. It is suggested that the ingot may be held as long as 60 to 90 min. before stripping and that the center of its upper portion will still be in a liquid or semi-liquid condition, with the outer portion of this 100 deg. C. hotter than the lower part of the ingot. The proper time of stripping is said to depend on the size of the ingot and the grade of metal.

## Employment for Soldiers Crippled in the War

Some 2,000,000 men in Europe have suffered the loss of limbs, faculties or both as the result of injury in the great war, according to Frank B. Gilbreth, consulting management engineer, Providence, R. I., who has returned from Germany, where he has been engaged in his calling. He says that the problem of adapting these crippled men to machines for manufacturing operations, or of even redesigning machines to fit the men, is a problem which will have to be solved in the near future. He is to discuss the subject at a meeting of The American Society of Mechanical Engineers, in the Engineering Societies Building, 29 West Thirty-ninth Street, New York, on Tuesday, October 12, at 8.15 p. m. Mr. Gilbreth will illustrate his talk with slides and demonstrate the use of the "chronocyclegraph," micromotion and simultaneous cycle chart. General discussion will follow in which, it is stated, all will be invited to cite some specific case of adaptability of mutilated men to machines.

The Pennsylvania Engineering Works, New Castle, Pa., has recently received orders for one 20-ton converter, ladles and equipment for duplexing at the Algoma Steel Corporation's plant, Sault Ste. Marie, Ont.; one 500-ton blast furnace for the Bethlehem Steel Company, South Bethlehem, Pa.; eleven 80-ton ladles for the Alan Wood Iron & Steel Company, Philadelphia; eight 100-ton ladles for the Minnesota Steel Company, Duluth; 1000 tons of gas piping for the new zinc plant of the American Steel & Wire Company, Donora, Pa.; one 6-ton converter for the National Malleable Castings Company, Sharon, Pa.; a number of electric tipping devices for metal mixers to take the place of hydraulic tipping mechanisms, and a number of buckets of the Edgar Brosius design, ranging from ¾ yd. to 3 yd. capacity. Reports that this company would operate its entire plant with a night force and would give employment to about 500 men are incorrect. Part of the machine shop will be operated at night for a time until work for which there is some urgency for delivery has been completed.

The Hydraulic Pressed Steel Company, Cleveland, Ohio, which recently took a sub-contract from the Baldwin Locomotive Works for forging 5,000,000 3-in. shells, is now turning out about 7000 shell forgings a day and expects to increase this number to 12,000 a day by Jan. 1. These forgings will be shipped to the Eddystone Ammunition Company, Eddystone, Pa., for machining.

It is announced that the Eastern Car Company, New Glasgow, N. S., has shipped its first consignment of 50-ton box cars to Russia via the Panama Cnal to Vladivostok. The shipment consisted of 250 complete cars, and is carried by one of the boats of the Nova Scotia Steel & Coal Company. The cars are all 5-ft. gage, and are the largest ever built in Canada.

The purchase of the equipment, buildings and real estate equity of the Prime Steel Company, Milwaukee, by Harris Brothers, Chicago, is not for the purpose of operating the plant but for the resale of the properties.

# OBITUARY

WILLIAM WATSON, since 1884 secretary of the American Academy of Arts and Sciences and an authority on technical education, died at his home in Boston, Mass., Sept. 30, in his eighty-second year. After graduating from Harvard he became an instructor in mathematics at his alma mater and in 1858 became an instructor in differential and integral calculus at the Scientific School. In 1859 he went abroad where he studied for several years. Upon his return he rejoined the faculty of Harvard. From 1865 to 1873 he was professor of mechanical engineering at the Massachusetts Institute of Technology, retiring from that position to devote his time to special work. He was the author of many mathematical text-books and a member and officer of numerous societies, both here and abroad.

ISAAC B. HAMMOND, Portland, Ore., died Sept. 23, aged 71 years. He was born in Lambs Corners, New York, but removed to the West in early life, where he had been associated with a number of industries and had much to do with the commercial growth of that part of the country. At the time of his death he was president of the Hammond Mfg. & Electric Company, which he founded more than 25 years ago. Practically all his life had been devoted to the manufacture of mining and electrical machinery. He was president of the Board of Trade of Portland and active in civic affairs.

ROBERT LEMUEL GREENLEE, Chicago, vice-president Northwestern Foundry Company, president Northwestern Stove Repair Company and vice-president Greenlee Foundry Company, died Sept. 28 at a sanitarium at Battle Creek, Mich. He went to Chicago with his twin brother, Ralph S. Greenlee, in 1862. Beginning as manufacturers of wood-working machinery, they extended their operations to other branches of trade, in which they became prominent.

## Cast Iron Free from Chilling Properties

J. E. Johnson, Jr., of New York, has invented a process for treating cast iron so as to remove oxygen, with the object of taking away chilling properties and making the iron soft and highly graphitic. The claim is made that the chilling properties of certain cast irons are due mainly to the presence of oxygen which tends to cause the carbon to take the combined rather than the graphitic condition and to appear as nodules rather than as flakes.

An electric furnace is recommended for carrying out the process, which is described in letters patent, U. S. 1,150,201—Aug. 17, 1915. Mr. Johnson takes advantage of the chemical reactions which will occur between oxygen and other constituent elements of the iron, such as silicon and carbon, under temperature conditions considerably higher than the temperature at which the iron comes from the furnace. Conditions are also maintained above the surface of the bath so that the oxygen will be prevented from entering the metal. The temperature found necessary is said to be as high as 3000 deg. Fahr. Hydrogen, carbon monoxide and other gases are injected into the chamber of the furnace to insure the absence of oxidizing conditions. An electrode furnace may be used, but the induction type is recommended as preferable.

The office of Alex. Miller & Bro., Inc., has been removed to 52 Vanderbilt Avenue, New York City, from the foot of Morris Street, Jersey City, N. J., where the company has its plant and conducts a business in steamboat building and also the manufacture of boilers, machinery, etc.

The Pennsylvania Railroad placed its Altoona machine shops on full time of 55 hours a week beginning Oct. 1, giving the new schedule to the entire force of 2000 men.

# Many New England Shops on Shorter Hours

## Results of Three Months' Agitation for Shorter Working Schedules Without Reduction of Pay —Many Plants Now Have Labor Troubles

The effort to disrupt long-existing working schedules in New England manufacturing plants began in the early part of July when the Remington Arms & Ammunition Company and the Union Metallic Cartridge Company, Bridgeport, Conn., granted the eight-hour day to their employees. These and other munitions plants were compelled to seek for machinists in order to carry on their operations on the vast scale contemplated and the pressure of their efforts was soon felt by the other Bridgeport shops which were obliged to make equally good offers to hold their employees.

Two of the plants most affected were the Bullard Machine Tool Company and the Locomobile Company, which voluntarily offered the eight-hour day. In the case of the Bullard company, at least, this change had been long considered as an economic measure, as the company was working twenty-four hours a day and had recognized the success attending the introduction of the eight-hour day in plants similarly situated. The Locomobile Company first attempted to hold its organization by the adoption of the bonus system, but its employees showed so marked a preference for the eight-hour day that the company finally granted it.

### 48-HR. AND 50-HR. SHOPS AT BRIDGEPORT

The following concerns in Bridgeport are now working under the eight-hour schedule: Locomobile Company, Bullard Machine Tool Company, American & British Mfg. Company, Remington Arms & Ammunition Company, Union Metallic Cartridge Company, Electric Cable Company, Bryant Electric Company, Standard Mfg. Company, R. P. K. Pressed Metal Company, Lake Torpedo Boat Company, Harvey Hubbell, Inc., Holmes & Edwards Silver Company, Wolverine Motor Works, Grant Mfg. & Machine Company, Burns & Bassick Company, Hawthorne Mfg. Company, Curtis & Curtis Company, Royal Equipment Company, Bridgeport Brass Company, Bridgeport Metal Goods Mfg. Company, Bridgeport Chain Company, Sprague Meter Company, Max Ams Machine Company, American Graphophone Company, Harris Engineering Company.

With the exception of the plants running three shifts, one of the three following schedules has been adopted:

| | A. M. | P. M. |
|---|---|---|
| *Schedule No. 1* | | |
| Monday to Friday | 7.00 to 12.00 | 1.00 to 4.30 |
| Saturday | 7.00 to 12.30 | |
| *Schedule No. 2* | | |
| Monday to Thursday | 7.00 to 12.00 | 1.00 to 4.30 |
| Friday | 7.00 to 12.00 | 1.00 to 5.00 |
| Saturday | 7.00 to 12.00 | |
| *Schedule No. 3* | | |
| Monday to Friday | 7.30 to 12.00 | 1.00 to 5.15 |
| Saturday | 7.30 to 11.45 | |

The following shops are operating under a 50-hour schedule: American Tube & Stamping Company, Armstrong Mfg. Company, Ashcroft Mfg. Company, Automatic Machine Company, Bridgeport Hardware Mfg. Corporation, Black Rock Machine Company, Bridgeport Motor Company, Coe-Stapley Mfg. Company, Connecticut Electric Mfg. Company, Gaynor Mfg. Comjany, Singer Mfg. Company, Yost Typewriter Works, White Mfg. Company, Heppenstall Forge Company, Coulter & McKenzie Machine Company, Ives Mfg. Company, J. S. Fray Company.

The majority of these plants operate under the following schedule:

| | A. M. | P. M. |
|---|---|---|
| Monday to Friday | 7.00 to 12.00 | 1.00 to 5.00 |
| Saturday | 7.00 to 12.00 | |

A few small plants in Bridgeport which have not been asked to change their schedule are running nine or ten hours as formerly. The shops which voluntarily reduced their working schedules made no change in their overtime rates. Only a few other shops made any concessions in their overtime rates, and in six of these it has been arranged that time and a half for overtime shall be paid for all time after 6 p. m.

An interesting feature of the Bridgeport situation is that it appears that none of the firms mentioned has recognized a shop committee or signed a union agreement. About 150 employees of the Max Ams Machine Company are again on strike as it is claimed that three men were discharged for their unionizing activities.

### THE CAMPAIGN AT WATERBURY

In Waterbury, Conn., the agitation for better hours began in the middle of August and continued until the last week in September when industrial peace was restored. On Aug. 25 the Scovill Mfg. Company voluntarily gave its employees a 55-hr. week and a 10 per cent increase in pay, affecting about 8000 hands. In the early part of September the city officials made short work of ridding the city of Joseph Ettor and other I. W. W. agitators who were working among the unskilled Italian laborers in the big brass plants.

On Sept. 7 the American Brass Company announced a voluntary reduction to a 55-hr. week and a 10 per cent increase in pay for all its mills in the Naugatuck Valley. The Chase Metal Works and most of the other brass mills soon followed.

Early in the agitation the Waterbury Farrel Foundry & Machine Company and the E. J. Manville Machine Company voluntarily reduced their schedules to the 50-hr. week. The men were not satisfied, however, and in a few days went on strike for the eight-hour day. The other machine shops were also affected, but the manufacturers stood firm, and on September 25 the employees of the Waterbury-Farrel plant voted to return and were soon followed by the shop crews of the other plants. They returned on the basis of the concessions first offered.

An effort to pull out the men at the Rowbottom Machine Company failed, as only three men went out, and this undoubtedly had some effect in bringing about the return of the men to the other machine shops.

### THE PRATT & WHITNEY STRIKE

Hartford, Conn., had its first important labor trouble on Sept. 29, when a large body of the Pratt & Whitney Company's employees went out, seeking an eight-hour day without reduction in wages, time and a half for overtime and double time for Sundays and holidays, and reinstatement of men alleged to have been discharged for their activities in labor matters. The company employs about 3000 hands and stated that 1152 men went out. The strike leaders claimed a much larger number. The older employees were almost entirely unaffected. At this writing little apparent progress has been made toward a settlement.

While there have been three or four small strikes in Hartford in the last four months, only a comparatively small number of men have been affected. So far there has been no effort made to pull out the men in the other large machine shops and foundries, as a part of the eight-hour agitation.

### SETTLEMENTS AT BRISTOL, CONN.

Bristol, Conn., has had some serious labor differences in the last few weeks, but all have been happily settled and the men have returned to work expressing the best of feeling toward their employers. The concern most seriously affected was the New Departure Mfg. Company, where 150 to 200 grinder hands struck on Aug. 31 because of the discharge of three employees. On Sept. 2 the employees asked for a 50-hour week, 10 per cent increase in pay and time and a half for overtime. After several counter proposals had been considered, so many men going out

that the shops were closed, though the strike leaders were against this, the company on Sept. 19 made an offer with an alternative—a 50-hour week with 57½ hours pay or a 55-hour week with 63½ hours pay. The employees voted to accept the 50-hour week with 57½ hours pay and time and a quarter for overtime. The night shift is to work 12 hours with overtime pay for all time over 10 hours.

The molders at the Sessions Foundry Company went out on Sept. 10, but the trouble was settled on the fifth day by an agreement to pay increases of 10, 15, 20 and 25 per cent for work on different patterns.

On Sept. 9 the employees of the Bristol Brass Company went on strike, the first trouble the company had had since it was organized in 1850. The men were disorganized and were not in agreement as to what they wanted. It was plain, however, that the concessions made by the brass plants in Waterbury were the cause of the walk-out. The men returned to work on Sept. 20 on the basis of a 60-hour week, 10 per cent increase in wages and time and a quarter for overtime.

### EIGHT-HOUR DAY AT SPRINGFIELD

About the middle of August agitation began in Springfield, Mass. The Smith & Wesson plant had offered a 5 per cent bonus to its employees. This was not satisfactory to the men and a little later the company offered a choice of a 48-hour week with no bonus or a 55-hour week with bonus. The employees voted in favor of the 48-hour week and the new schedule will go into effect on Jan. 1, 1916.

The New England Westinghouse Company on Sept. 2 granted the eight-hour day with time and a half for overtime, to take effect Sept. 15. The Baush Machine Tool Company and the Bosch Magneto Company soon followed with voluntary offers of the eight-hour day.

The first strike in Springfield occurred on Sept. 7, when the employees of the National Equipment Company demanded the eight-hour day and the reinstatement of men alleged to have been discharged for activities in labor matters. The strike only lasted two days as the company granted the strikers' demands, the union officials conceding a little later that the company was justified in discharging the men. Similar trouble at the Package Machinery Company was of short duration.

A little later the Knox Motors Company, Barney & Berry, Inc., and the Hendee Mfg. Company voluntarily granted a 48-hour week. The employees of the Hendee Mfg. Company were not satisfied with the adjustment of the piece prices and struck, demanding a straight eight-hour day with time and a half for overtime and recognition of the shop committee. From 1200 to 1400 men went out. The State Board of Arbitration now has the matter in hand and prospects of a settlement are brighter.

A voluntary reduction of the working schedule at the Van Norman Machine Tool Company announced to take effect on Jan. 28, 1916, when the 48-hour week would be adopted, was not satisfactory to its employees, and on Sept. 24 they went out after a demand that the new schedule go into immediate effect. On Sept. 29 an agreement was reached that the working schedule should be reduced to 50 hours on Oct. 4 and the 48-hour schedule should go into effect on Jan. 1.

The United States Envelope Company announced Sept. 30 that it would reduce its working hours from 55 to 48 per week. It has plants in Springfield, Holyoke and Worcester, Mass., Hartford and Rockville, Conn., Cincinnati, Ohio, and Waukegan, Ill. At the same time several paper mills in the Springfield-Holyoke district announced a similar reduction.

### THE BROWN & SHARPE STRIKE

The spread of the eight-hour agitation reached Providence, R. I., Sept. 19, when the employees of Brown & Sharpe Mfg. Company voted to make demands which included an eight-hour day with 10 hours pay, time and a half for overtime and double time for Sundays and holidays, reinstatement of some men who had been discharged, recognition of the union and conferences with shop committees over grievances which were to be settled by arbitration in the absence of an agreement. On the following day from 2500 to 3000 men went out. As might be expected in such a long-established concern, the older employees were mostly faithful and it was the younger and less attached element that responded to the efforts of the agitators who had labored for several weeks to bring about a strike.

Without question the strikers' ranks have not held solidly and the company's officials state that the men are slowly but constantly returning to their machines. It is reported that nearly 1000 hands returned to work last week.

### WORCESTER DEMANDS

After weeks of agitation, Worcester, Mass., had its first open trouble when the employees of the two plants of the Reed-Prentice Company struck on Sept. 20. The demands were for an eight-hour day, five cents an hour increase in wages, time and a half for overtime and double time for Sundays and holidays. Three days later the employees of the Whitcomb-Blaisdell Machine Tool Company joined the strikers' ranks and on Sept. 27 the shop of the Leland-Gifford Company was struck. In each case the plants were practically stripped of men. At a meeting held Sept. 30 the employees of the Crompton & Knowles Loom Works voted to strike at the command of the union officials. It is uncertain when the men will be called out, as it appears to be the intention of the strike leaders to secure a settlement, if possible, of some of the prevailing strikes before calling out more men. At a meeting on Oct. 2, the employees of the Norton Grinding Company voted to submit demands similar to those made on the other concerns, requesting a reply by Friday, Oct. 8.

The manufacturers in Worcester are issuing statements that no concessions will be granted and no settlement is now in sight.

Many other New England communities are involved in labor troubles but in only a few cases have there been riots or street disturbances. The most disorder has been in New Britain, where there have been several strikes by unorganized groups of employees who in many cases have made no formal demands. Many of the New Britain strikers have been able to speak but little English and in spite of the earnest efforts of the employers it has taken days to straighten out the differences which have been largely matters of little moment.

## Manganese Imports Declining

Ferromanganese imports into the United States for the second quarter of 1915 were 19,857 gross tons, valued at $1,115,936, according to the statistics of the Bureau of Foreign and Domestic Commerce. Imports in the first quarter were only 548 tons, making a total of 20,405 tons to July 1, 1915. For the fiscal year ended June 30, 1915, total imports of ferromanganese were 66,020 tons. This contrasts with a normal total of 100,800 tons based on a five-year average. In 1913, with record steel production, the imports of ferromanganese were 128,064 tons.

Manganese-ore imports into the United States for July were 28,988 gross tons against 28,807 tons in July, 1914, probably all from Brazil. Considering that in July, 1914, ore was coming from India and Russia, the expansion in the Brazilian output is evident. For seven months, however, the decrease in imports is marked, the total being only 87,136 tons to Aug. 1, 1915, as compared with 163,390 to Aug. 1, 1914, and 227,761 tons to Aug. 1, 1913.

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Manganese ore imports into Great Britain were only 10,611 gross tons in August against 78,156 tons in August, 1914. The August imports last year were more than normal, because of diversions to that country caused by the breaking out of war. Total imports for the first eight months of this year were only 164,769 tons against 356,330 tons in the same period in 1914.

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The Maxwell Motor Company has ordered for its Dayton, Ohio, plant a battery of drawer-type core ovens from the H. M. Lane Company, Detroit, Mich.

## Possible Merger of Bethlehem and Pennsylvania Steel Companies

The Eastern steel trade has been on the qui vive in the past week in view of more substantial reports concerning efforts at mergers. For a time the Midvale Steel Company purchase was currently connected with these efforts, but there is now little inclination to think of that company as a nucleus of a steel consolidation, whatever plans may be worked out in lines of munitions manufacture.

The report to which more credence has been given is that the Bethlehem Steel Company and the Pennsylvania Steel Company may be brought together. Bethlehem Steel Company officers have been in conference in the past week with representatives of the Pennsylvania Railroad, and the fact of the Pennsylvania Railroad ownership of control of the Pennsylvania Steel Company and the Cambria Steel Company has led to reports that these companies would eventually be taken up in a Bethlehem merger. Another view is that the Bethlehem Steel Company is seeking to acquire simply the Pennsylvania Steel Company. The Mayari ore properties of the latter in Cuba are an important asset, and the tidewater steel and shipbuilding plants of its subsidiary, the Maryland Steel Company, become important in view of the large shipbuilding program ahead of the United States and the entrance of the country upon a great career in the export trade. So far as products go the Bethlehem and Pennsylvania companies are competitors on rails, structural steel, castings and to an extent on tool steel. Acquisition of the Pennsylvania Steel Company would give the Bethlehem interests a considerably enlarged pig-iron and steel capacity, the Pennsylvania Steel Company having carried on an extensive program of blast-furnace reconstruction in the past two years, besides making a large addition of open-hearth furnaces, building a new blooming mill and acquiring the structural mill of the Milliken Brothers' steel plant on Staten Island. The new open-hearth plant at Steelton consists of two tilting furnaces and six fixed furnaces.

The Pennsylvania Company held on Dec. 31, 1914, $9,158,300 of the preferred and $7,388,900 of the common stock of the Pennsylvania Steel Company, while the Pennsylvania Railroad Company owned $584,700 of the preferred stock. The outstanding stock of the Pennsylvania Steel Company is $20,560,800 preferred and $10,750,000 common. The Pennsylvania Company also owns $22,504,100 out of the $45,000,000 of capital stock of the Cambria Steel Company. In April, 1914, when W. H. Donner, president of the Cambria Steel Company, became chairman of the board of directors of the Pennsylvania Steel Company, it was stated that he and his associates had an option on the Pennsylvania Railroad holdings in the Pennsylvania Steel Company. At various times reports have come out that preparations were being made for bringing together the Cambria Steel Company and the Pennsylvania Steel Company, but there has been no such merger, though with W. H. Donner heading both there has been naturally more or less co-operative management.

There is authority for the statement that recently W. H. Donner and others have taken over the Pennsylvania Railroad's $22,504,100 holdings in the Cambria Steel Company at $60 a share, the par value being $50.

## Chevrolet Motor Car Expansion

The Chevrolet Motor Company of Delaware, a holding company for the Chevrolet Motor companies of New York, Flint., Mich., Tarrytown, N. Y., and Toronto, Canada, has been incorporated with a capital stock of $20,000,000. Announcement has been made by William C. Durant, president of the company, that plans provide for a manufacturing center at Flint. The plants of the Mason Motor Company, which manufactures motors for the company, and of the Walker-Weiss Axle Company, which makes its axles, both at Flint, will be greatly enlarged and their present output of parts for 200 cars a day will be practically doubled. The statement has been made that 60,000 cars will be manufactured in 1916 by the present enlarged plants, and in 1917 plans call for 200,000 cars to be produced at various assembling plants in a similar manner to the Ford plan. Assembling plants will be established at Oakland, Cal., and St. Louis, Mo. Russel E. Gardner, of the Banner Buggy Company, has arranged to incorporate the Chevrolet Motor Company of St. Louis with a capital stock of $1,000,000. A. B. C. Hardy is general manager of the new Delaware corporation.

## Large Lake Ore Shipments

The shipments of iron ore down the Lakes from the Lake Superior region in September were 7,863,146 gross tons compared with 5,431,307 tons in September, 1914, an increase of 2,431,839 tons, or 44.77 per cent. In August this year they were 8,081,117 tons. The following table gives the September and season shipments by ports and the corresponding figures for 1914 in gross tons:

| | September, 1915 | September, 1914 | To Oct. 1, 1915 | To Oct. 1, 1914 |
|---|---|---|---|---|
| Escanaba | 1,015,820 | 553,959 | 4,011,682 | 3,019,451 |
| Marquette | 539,879 | 335,928 | 2,313,532 | 1,385,718 |
| Ashland | 1,028,363 | 662,141 | 3,829,582 | 2,741,317 |
| Superior | 1,557,935 | 1,901,422 | 5,997,023 | 9,478,253 |
| Duluth | 2,428,689 | 1,126,532 | 11,807,219 | 5,278,899 |
| Two Harbors | 1,292,460 | 851,325 | 6,710,528 | 4,804,975 |
| Total | 7,863,146 | 5,431,307 | 34,669,566 | 26,709,413 |
| 1915 increase | 2,431,146 (44.77 per cent) | | 7,960,153 (29.8 per cent) | |

The Duluth percentage to Oct. 1, 1915, was 34.06 against 19.76 per cent last year, while the Great Northern dock at Superior shipped only 14.93 per cent of the total this year against 33.21 per cent to Oct. 1, 1914. The increase to Oct. 1, 1915, of 7,960,153 tons, or 29.8 per cent, contrasts with a decrease of 12,564,004 tons to Oct. 1, 1914.

## Central Iron & Steel Reorganization

Reorganization of the Central Iron & Steel Company, Harrisburg, Pa., which has been in the hands of receivers, along lines decided upon several months ago, has been agreed to by a large number of stockholders, bondholders and creditors and is now operative. A committee consisting of A. A. Jackson, Robert C. Dayton, J. M. Cameron, James B. Bonner, B. H. Jones and Ross A. Hickok has been appointed to conduct the affairs. The bondholders and creditors who have not yet filed claims and stockholders who have not yet filed their assent to the change have until Dec. 1 to do so by communicating with the Girard Trust Company, Philadelphia, or the Dauphin Deposit Trust Company, Harrisburg, Pa.

In the suit of Davy Brothers and the United Engineering & Foundry Company vs. Camden Iron Works and R. D. Wood & Co., Judge Height of the United States District Court of New Jersey has just handed down an opinion sustaining both the Holmes patents, Nos. 813,209 and 596,211, relating to hydraulic presses working on the steam intensifier system and stuffing boxes for hydraulic cylinders, and holding the patents infringed. Important features in this type of press were developed in England and introduced in this country by the United Engineering & Foundry Company some years ago.

The Heinle Company, metal-rolling engineer, Crafton, Pittsburgh, Pa., informs THE IRON AGE that it has drawn up explanatory chart showing the shape of roll grooves for rolling hexagon bars and the dimensions of the billet in its progressive stages through the rolls.

## PERSONAL

Chairman E. H. Gary of the United States Steel Corporation returned to New York last week after a three months' absence, his vacation trip including the Pacific coast and Hawaii. Concerning business conditions he made this statement: "In remarks before the Commercial Club in San Francisco early in July I referred to general business prospects as being improved and gave the reasons. However, I am pleased to say at this time I find on my return to the office that the steel business at present is satisfactory. Our bookings and shipments are about equal to our capacity, and the prices received, while not in some respects sufficiently and reasonably remunerative, are on the whole fairly good, and therefore will result in substantial profits."

John C. Jay, Jr., who resigned as general manager of sales and vice-president of the Pennsylvania Steel Company to become chairman of the Maxwell Motor Company, was the guest of honor at a dinner given by the officers of the Pennsylvania Steel Company and the Maryland Steel Company at the Bellevue-Stratford, Philadelphia, Sept. 29.

J. E. Johnson, Jr., will address the Pittsburgh Foundrymen's Association Monday evening, Oct. 18, on "What Is Good Iron."

J. L. Jacobs, Monadnock Block, Chicago, formerly engineer in charge of the municipal efficiency division of Chicago, has established an office to undertake supervision or conduct of expert investigations connected with service and efficiency surveys, management, appraisals and cost accounting.

W. H. S. Bateman, who for a number of years has represented the Champion Rivet Company, Cleveland, Ohio, and the Parkesburg Iron Company, Parkesburg, Pa., with offices in Philadelphia, and in addition has been trading as W. H. S. Bateman & Co., has been appointed Eastern sales agent of the Canton Sheet Steel Company, Canton, Ohio, with offices in New York and Philadelphia. J. G. Esslinger, formerly with the Youngstown Sheet & Tube Company, will have charge of the New York office, and Joseph R. Wetherald will have charge of the Philadelphia office.

John F. Wade, general superintendent, New Departure Mfg. Company, Bristol, Conn., has resigned and will become connected with the Bristol Brass Company, East Bristol. At a luncheon of the officials and foremen Sept. 30, he was presented with a gold watch and chain. His successor is Frank C. Wilcox, recently in charge of the milling and drilling department, who has been in the employ of the company for 22 years.

W. A. Locke is now resident manager of the Taunton-New Bedford Copper Company, 35 Howard Street, New York, having succeeded William H. Steele, who held that position for the past 20 years, retiring Oct. 1. Mr. Locke has been associated with the sheet copper business for a period of over 25 years, dating from his connection with the Ansonia Brass & Copper Company.

Robert M. Keeney has become connected with the Standard Chemical Company, Canonsburg, Pa.

R. O. Hocking will act as inspector of mining operations with the Meriden Iron Company, Hibbing, Minn.

Stanley H. Smith has been appointed district sales manager of the Pennsylvania Steel Company at Chicago, succeeding Robert E. Belknap, transferred to New York City. Mr. Smith has been first assistant in the Chicago office.

William M. Dailey, private secretary to A. C. Dinkey since 1906, has resigned his connection with the Carnegie Steel Company and will go with Mr. Dinkey to the Midvale Company in the same capacity. He began his service with the Carnegie Company as stenographer in 1881.

Edward Hamilton, heretofore assistant general superintendent of the Duquesne works of the Carnegie Steel Company, has been appointed general superintendent to succeed Homer D. Williams, who was elected president of the company on Tuesday.

### Westinghouse Electric Concessions to Employees

Employees of the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., recently made a demand for an 8-hr. day, an advance in wages of about 20 per cent, an increase in the rate of wages for overtime and the reinstatement of an employee who had been discharged. E. M. Herr, president, after considering the demands, has made a statement to the grievance committee as follows:

> After a full and complete discussion of the matters which you have brought to my attention as requests from our employees in the shops in the matter of hours of service and wage conditions, it has been decided to grant to all of our shop employees on check an average 8-hr. and 40-min. day, instead of average 9-hr. day, or a 52-hr. week, instead of a 54-hr. week. The adjustment of wages will be made to the nearest ½ cent to give the same weekly wage for 52 hr. now obtained for 54 hr.
>
> In addition, the company for the next calendar year, beginning Oct. 1, 1915, will grant a bonus to all shop employees of 6 per cent on the earned wages, payable in progressive quarterly installments, as will be fully set forth in bulletin to be posted as soon as it can be prepared. The new shop hours will begin Friday, Oct. 1, 1915.

The progressive quarterly installment will net the employees a yearly increase of about 10 per cent in wages.

The employees have accepted this offer and there will be no strike. More than 9000 employees voted in favor of accepting the proposition, while only a little more than 2000 favored a strike.

### Cleveland Labor Troubles

About 400 employees of the Cleveland Automatic Machine Company, Cleveland, Ohio, went on strike Oct. 1 to enforce demands for an 8-hr. day and the reinstatement of about fifteen union employees who had been discharged. The following day the company shut down its plant. A conference between the strikers and A. L. Garford, president of the company, was held Oct. 4 at which certain concessions were offered to the men which are expected to prove satisfactory, and the strike will probably be called off.

The Warner & Swasey Company's employees have also made demands for an 8-hr. day, with the same pay as for ten hours. This company has declined to deal with the machinists' union, but has expressed its willingness to take up grievances directly with its employees.

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The Cleveland, Ohio, Division of the International Sales Managers' Association held a banquet at the Cleveland Chamber of Commerce Sept. 23, with 30 members in attendance. This was the first evening meeting of the Cleveland Division, which now has a membership of about 35, composed of salesmanagers of manufacturing and wholesale organizations in Cleveland. Melvin Pattison, salesmanager Brown Hoisting Machinery Company, is president and James A. Grubb, Wilmington Fibre Specialty Company, is secretary of the division. The various divisions of this country-wide organization have adopted the plan of holding monthly meetings on the last Thursday of every month.

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A voluntary increase of 10 per cent in wages was made Oct. 1 by the Gisholt Machine Company, Madison, Wis. More than 500 employees, nearly all skilled machinists, are affected. The company has never experienced so great a rush of business as in the last eight months and has raised wages as an appreciation of the faithful service of its organization in maintaining a record-breaking production.

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The Baltimore Drydock & Shipbuilding Company, Baltimore, of which Holden A. Evans is vice-president and general manager, has received a contract to build two 293-ft. oil tank steamers for Christopher Hannebig of Norway. The contracts amount to approximately $500,000.

## Pittsburgh and Nearby Districts

A meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers will be held in the Seventh Avenue Hotel, Pittsburgh, on Saturday evening, Oct. 9, preceded by a dinner. The paper for the evening is entitled "Automatic Telephone in the Iron and Steel Industry," by Samuel Suekoff, Automatic Electric Company, Pittsburgh.

The Marietta Mfg. Company, Point Pleasant, W. Va., contemplates erecting a plant to build compound steam engines. It will be a two-story structure, to cost about $15,000.

The plants of the Ohio Sterling Company and the Ohio Foundry Company at Dayton, Ohio, have been bought by the East Dayton Realty Company, and it is stated that a new company will be organized to use the properties for manufacturing purposes.

The Pittsburgh Foreign Trade Commission reports an inquiry from Schoenfeld & Co., Glasgow, Scotland, for machines for making rivets, studs and screws and also for wire-forming machines. These machines were formerly imported from Germany, but the European war has cut off this supply and the importers are now seeking American machines.

The Pennsylvania Railroad Company has just built and placed in service five 70-ton cars of a new type. They left the yards of the National Tube Company, McKeesport, Pa., last week loaded with pipe, aggregating 770,000 lb., consigned to the United States Steel Products Company for export to East India.

The Standard Steel Car Company, Frick Building, Pittsburgh, is reported to be in the market for about 200 lathes, most of which are to be installed in its works at New Castle, Pa.

The Consolidated Coke Company, Uniontown, Pa., has absorbed the Pickands-Magee Company, Pittsburgh, and will sell coal and coke direct to consumers. Charles L. Doyle, 2126 Oliver Building, Pittsburgh, is manager of sales for the Consolidated Company, the product of which was formerly sold by the Pickands-Magee Company, with which he was identified.

The Ball Engine Works, Erie, Pa., will build an addition to its boilerhouse, 25 x 50 ft.

The Erie Trailer Mfg. Company, Erie, Pa., has been incorporated to manufacture trailers for automobiles and trucks. The incorporators are H. A. Wilburn, C. C. Leon and Frank Schreu. The capital stock is $100,000.

To encourage thrift among its employees, the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., has established a savings fund. It is open to any employee of the company, wherever he may be located, and he may become a depositor or discontinue at any time. A deposit cannot be less than 10c. and may be any multiple thereof, and the deposits must be made from each regular pay. The deposit, however, is limited to one account, the amount of which in any one year cannot exceed $500. Interest is paid at the rate of 4½ per cent and is credited semi-annually. The company acts as a trustee and guarantees the deposits and interest. An auditing committee not to exceed seven persons is to be elected by the depositors from among their own number.

The Brady Scrap Company, Pittsburgh, with a capital of $20,000, has been incorporated by Harry Hood, 1942 Forbes Street, Pittsburgh; Gustav Schmall, Philadelphia, and Thomas P. Kennelley, Pittsburgh, to manufacture commercial metal from scrap.

The S. S. V. Motor Company, Pittsburgh, capital $10,000, has been incorporated by J. H. Weeks, 6336 Burchfield Avenue; J. R. Zinkman, 1218 North West Carson Street; Charles B. Gearing, 14 Buffalo Street, and J. F. Tyrell, 402 Frick Building, Pittsburgh, to manufacture gas engines, motor-driven vehicles, etc.

The National Enameling & Mfg. Company, Pittsburgh, capital $10,000, has been incorporated by W. S. Armstrong, New Kensington, Pa.; R. B. White, Pittsburgh, and B. F. Bachman, Swissvale, Pa., to manufacture enameled metal products.

The Solid Drawn Forging Company, Ellwood City, Pa., capital $100,000, has been incorporated by W. H. Lemon, 1677 Beechwood Boulevard, Pittsburgh; E. B. Strassburger, Pittsburgh, and K. A. Martin, Bellevue, Pa., to engage in a general iron and steel manufacturing business.

The Standard Electric Construction Company, Pittsburgh, capital $10,000, has been incorporated by Thomas A. Craig, 5540 Avondale Place; William C. Hemmerle, 1009 Grandview Avenue, and John E. Laughin, 5868 Solway Street, to manufacture and repair electrical machinery.

The United States Steel Ware Company, Pittsburgh, capital $20,000, has been incorporated by R. E. Bebb, president, Canton, Ohio; William T. Hedges, vice-president, Bellaire, Ohio; W. K. Merrick, treasurer and manager, Cedar Avenue, Pittsburgh; L. M. Barton, secretary, Pittsburgh, and Roy Rose, Sewickley, to conduct a general brokerage business.

The Klimke Machine Company, McKees Rocks, Pa., capital $10,000, has been incorporated by Harry Leck, 725 Boquet Street; Frank Heigel and Anton E. Klimke, to manufacture machinery.

The Allegheny Steel Company, Pittsburgh, works at Brackenridge, Pa., has received an order for a quantity of brass shells from a syndicate commissioned to buy munitions and supplies for neutral countries. A complete line of machinery is now being installed for use in their production, and employment will be given to a number of additional men, experienced in the operations of lathes, drill presses, etc. The present orders are for Sweden and Greece.

The Liquid Fuel Combustion Company, 5113 Jenkins Arcade Building, Pittsburgh, Pa., incorporated with a capital stock of $500,000, will build a factory, 96 x 136 ft., and a three-story warehouse, 84 x 136 ft., for the manufacture of oil-burning apparatus. V. Wyss-Thalman is president, and Robert L. Wickline, secretary and treasurer.

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### New York State Steel Company

It is understood that several interests have been considering the acquisition of the plant of the New York State Steel Company at Buffalo, N. Y., with a view to putting it into operation, because of the strong demand for semi-finished steel of every description. There is a blast furnace, and the steel plant has two 200-ton Talbot furnaces with an annual capacity of 100,000 to 125,000 tons. The product is ingots, billets, blooms and slabs. The plant has been idle for several years. One proposal that has been under discussion is the purchase of the plant on a basis of 80 per cent of the bonded indebtedness.

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### Youngstown Sheet to Build More Open-Hearths

The Youngstown Sheet & Tube Company, which now has six open-hearth furnaces at East Youngstown, Ohio, has decided to add three more and has placed a contract with the American Bridge Company, Pittsburgh, for an extension of its present open-hearth building that will require about 3500 tons of steel. Contracts for equipment for the three new furnaces will be placed shortly. They will increase the monthly capacity of the Youngstown Sheet & Tube Company from 30,000 tons to about 45,000 tons.

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The Wisconsin board of industrial education has apportioned the sum of $125,000 as State aid for industrial education to 29 cities. Each city is allowed a certain percentage of its actual expenditures in conducting vocational schools below a maximum sum. The city of Milwaukee receives $10,000, but next year will be entitled to $15,000, the last Legislature having increased the maximum.

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The second shipment of machinery from the Panama Canal has been sent to Anchorage, Alaska, for use by the United States Government in railroad construction. It consists of 1300 tons, and comprises flat cars, boilers, dump cars, drills, shop machinery and repair parts.

# Machinery Markets and News of the Works

## CANADA PROMISING FIELD

### Heavy Gun and Shell Orders Expected

### Buying and Inquiries for Machine Tools Maintain Their High Level—Inquiry Now More Actual Than Tentative

From no direction is there any indication of abatement in the demand for machine tools so far as actual business goes, though there are fewer of the tentative inquiries for shell-making equipment. Shell makers have been steady buyers in New York, and the demand from interests apart from munitions makers shows a betterment. In Detroit sales and inquiries have been running undiminished; in Cleveland the demand maintains its high level; in Indianapolis a number of manufacturers have an entire year's business ahead on their books; Milwaukee's activity is unimpaired. In New England many machine tool builders are hampered by labor trouble, but seem to be holding a large percentage of their older employees and believe they will soon be running normally.

The U. S. Arsenal, Watertown, Mass., will build a one-story press shop, 115 x 284 ft. The Victor Typewriter Company will build at Poughkeepsie, N. Y., (not Lawrence, Mass.,) a factory 70 x 750 ft. In New York there has been some buying by the Lehigh & New England Railroad, and the Chesapeake & Ohio is in the market for a few tools. Some large purchasing has been done by the firm of J. P. Morgan & Co. The William Cramp & Sons Ship & Engine Building Company, Philadelphia, has awarded a contract for the construction of a two-story shop, 212 x 540 ft., to cost about $100,000, and other improvements are contemplated. Some attractive business in heavy machine tools is promised in Canada, which already has taken great quantities of shell-making machinery. Orders will be placed in the Dominion by the British Government for the manufacture of heavy guns at a cost of about $50,000,000, while it is reported, also, that shell orders aggregating $80,000,000 are on the way to Canada. The contract will cover 9.2-in. and 12-in. shells. It is estimated that Canadian plants now are producing 800,000 shells a month.

The New Process Gear Corporation, Syracuse, N. Y., has let a contract for a five-story machine shop to cost $75,000. The General Electric Company, Schenectady, N. Y., will construct a furnace building at a cost of $100,000. The Buffalo Forge Company, Buffalo, N. Y., has started the construction of a one-story erecting shop, 125 x 200 ft.

The Warner & Swasey Company, Cleveland, Ohio, turret lathe maker, will add a five-story brick and steel building of 75,000 sq. ft. floor space to its plant. The Wood Tilted Turret Machine Company, Brazil, Ind., has booked some large orders for railroad shops in Australia and New Zealand.

The Hamilton & Beach Mfg. Company, Racine, Wis., will add to its plant an addition costing $100,000. The Gardner Mfg. Company, manufacturer of metal grinding and pattern making machinery is planning an addition to its plant.

Birmingham reports that second-hand tools have been exhausted in that district and more are in request. General business in that territory is improving.

In the Pacific Northwest metal-working equipment shows but little life, many prospective purchasers holding back because of the high prices. A good item from that direction is the purchase of more than $100,000 worth of equipment within the past few weeks by the Copper River & Northwestern Railroad, Alaska.

## New York

NEW YORK, Oct. 5, 1915.

Makers of shells are still active buyers of machine tools, but there are fewer of the many tentative inquiries which flooded the trade a few weeks ago and which were put out by companies merely contemplating the making of munitions, many of whom had no definite prospect of getting an order. The Canadian Shell Commission is said to have placed some business here in the past few days, but this report is at variance with the fact that Canadian companies, already working on shrapnel, are looking for additional business in New York. As heretofore stated the demand is now principally for the larger sizes of high-explosive shells. At the present time the best field for shell orders appears to lie in taking sub-contracts from companies who have large orders and whose estimated output is running behind. A few of these are mentioned in discussions of shell-making. One of the reasons for delayed production is labor trouble which has affected the deliveries of machine tool builders.

Domestic lines are getting busier in the opinion of the trade, one evidence of which is the increased number of inquiries coming out for one or two machine tools, while some good-sized groups of tools have been sold also. There is much talk of increasing equipment. The Frick Company, Waynesboro, Pa., which is very busy, has purchased about $30,000 worth of tools through a New York house. Other Waynesboro companies, including the Landis Machine Company and the Landis Tool Company, are rushed to capacity. The only complaint of manufacturers of that city is caused by the effort of agents of automobile companies to take their men away.

Domestic inquiry for hoisting machinery has increased perceptibly. To the steel plants, who have been buying actively, have been added the railroads which have sent out several specifications, mostly for locomotive cranes. One request is for six. The entry of the railroads is considered to be more or less a permanent addition to the domestic trade. A great deterrent to the placing of business is the almost universal demand for immediate shipment. Competition in this line continues keen.

The Chesapeake & Ohio Railroad Company has a list out covering a few machines, and orders are being placed by the Lehigh & New England for its Penn Argyle shops which have long been under construction.

The purchasing department of J. P. Morgan & Co. has been buying heavily for export to England and other countries in the past few days. Some tool builders regret that they are so completely sold out to munitions makers that they cannot do more in serving the domestic trade, and as soon as the pressure on their shops is easier, they intend to set aside more machines of every lot for normal uses.

The Acme Die Casting Corporation, Bush Terminal No. 5, Brooklyn, N. Y., has increased its capital stock of $125,000 to $200,000, and has contracted for additional manufacturing space. It plans to double its present output within the next four months.

The American Saw Mill Machinery Company, Hackettstown, N. J., has added a 75-ft. extension and is now at work on a 90-ft. addition to its machine shop. This will make the shop 80 x 195 ft. The company has added a lot of new equipment to take care of its large machine-tool contracts. R. H. Richards is president.

The Simonds Mfg. Company, Lockport, N. Y., manufacturer of steel knives, saws, files, etc., has erected a new bar mill, 68 x 153 ft., in which it is installing a stand of 10-in. rolls and a stand of 16-in. rolls, both motor-driven. The addition has been made necessary by an increase in its saw business. W. G. Merriman is superintendent.

Plans have been completed for an addition to the chilled plow department of the Moline Plow Company, Poughkeepsie, N. Y. N. I. Milliken is manager.

The Ansco Company, Binghamton, N. Y., has let a contract for a two-story addition to its plant.

The New Process Gear Corporation, Syracuse, N. Y., has let a contract for the erection of a five-story machine shop, 118 x 181 ft., of reinforced concrete; cost, $75,000.

The General Electric Company, Schenectady, N. Y., will at once commence the construction of a furnace building, 60 x 178 ft., one story, to cost $16,000. C. G. Hulth is superintendent of building.

Work has begun on the one-story erecting shop, 125 x 200 ft., steel and brick, for the Buffalo Forge Company at Broadway and Tousey Street, Buffalo.

The Hammond Steel Company, Solvay, N. Y., has let a contract for an annealing building, 45 x 83 ft.

Ilion, N. Y., is advertising for bids for a filter plant for waterworks. J. D. Ringwood, engineer, can be addressed.

The Jenson Creamery Machinery Company, Kerhonksen, N. Y., has been organized with a capital stock of $200,000 to manufacture creamery machinery, etc. E. T. Magoffin and P. S. Hill, 615 West 142d Street, New York, are the incorporators.

## Philadelphia

PHILADELPHIA, PA., Oct. 4, 1915.

The William Cramp & Sons Ship & Engine Building Company, Philadelphia, has awarded contract to the Hoffman Engineering & Construction Company, Pennsylvania Building, Philadelphia, for the construction of a two-story iron and frame shop, 212 x 540 ft., to cost about $140,000. It is reported that the company plans other improvements and additions and that it will rearrange its yard.

The Welsbach Company, 922 Chestnut Street, Philadelphia, has awarded contract to the William Steele & Sons Company, 1600 Arch Street, for the construction of four factory buildings at its plant at Gloucester, N. J., to cost about $500,000. It is planned to eventually construct 17 buildings tc complete the plant. The structures to be built now include a warehouse, a factory, a hardening building and a knitting department.

Cramp & Co., Denckla Building, Philadelphia, have been awarded contract for the construction of a seven-story factory to be erected at 315 Arch Street for Charles E. Schmidt at a cost of about $100,000.

The New York Shipbuilding Company, Camden, N. J., has been granted permit for a one-story frame and iron storage building, 83 x 89 ft.

The William Steele & Sons Company, 1600 Arch Street, Philadelphia, has been granted permit for the construction of two factory buildings, 65 x 81 ft., one story, and 65 x 87 ft., three stories, to be erected at Seventeenth and Stevens streets, Camden, N. J., for the Keystone Leather Company.

The C. B. Coles & Sons Company, Front Street below Kaighn Avenue, Camden, N. J., manufacturer of boxes, etc., plans the erection of a two-story brick and stone building, 92 x 120 ft., to be erected at Front and Camac streets.

The Roydhouse-Arey Company, Fidelity Building, Philadelphia, Pa., has been granted a permit for the construction of a powerhouse, 20 x 75 ft., to be erected for the Children's Hospital at a cost of about $2,200.

Weaver & Co., New Oxford, Pa., have been incorporated with a capital of $5,000 by John S., Joseph B., Frank L. and James R. Weaver, to manufacture farm machinery, utensils, and engage in a general foundry business.

The Engineers' Specialty Mfg. Company, Scranton, Pa., has been incorporated with a capital stock of $30,000 to manufacture engineers' supplies and machinery. Edward A. Jones, 628 Clay Avenue, Scranton; John C. Jones, Throop, Pa.; Walter L. Henwood and Jerome W. Leverich, Scranton, are the incorporators.

The Eastern Specialty Company, Philadelphia, with a capital of $25,000, has been incorporated by Hugh H. Eby, 3859 Gratz Street; Charles R. Mullen and Vivian Frank Gable, 3651 North Fifth Street, Philadelphia, to manufacture mechanical and electrical specialties.

The K. K. Mfg. Company, Philadelphia, has been incorporated with a capital of $5,000 by Charles K. Kline, 536 Columbia Avenue, Philadelphia; Max H. Klinger, Philadelphia, and A. DeLong Kline, Lansdale, to manufacture novelties.

The Potter-Mackie Mfg. Company, Pottstown, Pa., has been incorporated with a capital of $35,000 by Norman S. Mackie, Chestnut Hill; S. Cary Potter, Haverford; Elton Hoyt, and Amara S. Mather, Cleveland, Ohio, to manufacture tools, machinery and equipment.

The Gamble Fuel Briquette Company, recently organized to manufacture coal briquettes, has taken out a permit to erect a one-story frame factory at Ninth and Dock streets, Harrisburg, costing $6,500.

The Southwark Foundry & Machine Company, 430 Washington Avenue, Philadelphia, has increased its capital stock from $500,000 to $1,300,000.

The Federal Radiator Company, New Castle, Pa., has filed notice of an increase in debt of $150,000.

The Steinhauer Company, Kingston, Pa., capital $6,000, has been incorporated by George B. Steinhauer, 416 Maple Street, Kingston, and others to manufacture wooden articles.

The Soap Works Equipment Company, Philadelphia, has been incorporated with a capital of $5,000 by Charles J. Grummon, 944 West York Street; Wray C. Arnold, 121 North Twentieth Street, and Frank A. Moorshead, Landsdown, to manufacture mill supplies and equipment.

The McCambridge Company, Philadelphia, has been incorporated with a capital of $50,000 by William Allen, Bala, Pa.; F. R. Hensell, George H. Martin and S. C. Seymore, Camden, to manufacture plumbers' and steamfitters' material and supplies.

## New England

BOSTON, MASS., Oct. 4, 1915.

New England manufacturers continue to show evidence of the pressure of present business and, notwithstanding the present unrest in labor circles, a faith in continued prosperity by making additions to their plants. The effects of increasing general prosperity are made evident by reports of improved business by plants not interested, or at least but remotely, in war orders. Many of the large machine-tool builders are experiencing labor troubles and the press reports large numbers of men leaving the cities where strikes are in progress to work in the shops where the 8-hr. day is in force. It is seemingly impossible to verify these reports and their truth will not be definitely known until the strikes are settled. The manufacturers seem to be holding a large proportion of their old help and express confidence that all the plants will soon be running peacefully with normal working forces. While the 8-hr. agitation in each city has almost without exception started in the machine shops, it has spread to all kinds of industries, particularly those in which large numbers of women are employed.

The Norfolk Mfg. Company, Norfolk, Conn., has filed a certificate of incorporation with authorized capital of $50,000 to manufacture clamps, wrenches and tools.

The Sentinel Mfg. Company, New Haven, Conn., has filed a certificate showing an increase of capital stock from $200,000 to $600,000.

The Snell Mfg. Company, Snellville, Mass., manufacturer of augers and bits, will increase its equipment, it is reported, as the result of large foreign orders.

The Anderson Die Machine Company, Bridgeport, Conn., has filed a certificate of incorporation showing authorized capital of $15,500 with $2,500 paid in cash. N. H. Anderson of Bridgeport is president.

An interesting report of the week is that of the purchase of 10,000,000 lb. of copper by R. B. Phillips from the American Smelting & Refining Company. Mr. Phillips is the head of the R. B. Phillips Mfg. Company, which has two plants in Worcester, Mass., and one in Lowell, Mass. It is understood that the copper will be used mostly in the manufacture of fuses for European belligerents.

The town of Putnam, Conn., has voted $20,000 for the erection of a State trade school.

The Bristol Brass Company, Bristol, Conn., will proceed at once with the erection of a sheet brass mill, 205 x 300 ft., with ell 30 x 60 ft.

It is reported that the stockholders of the New Departure Mfg. Company will be asked to authorize an increase of capital stock of $500,000, making the total capitalization $2,500,000. This increase is made necessary by the new buildings which are in course of erection and which will give room for about 1000 more employees.

Negotiations are now pending according to unconfirmed reports for the purchase of the plant of the Knox Motors Company, Springfield, Mass., by one of three large munitions concerns. The Bethlehem Steel Company, the General Electric Company and the New England Westinghouse Company

are mentioned as the concerns that are bidding for the Knox plant.

The A. G. Spalding Company, Chicopee, Mass., is to add three more stories to the one-story building now in the rear of its main building.

The American Graphophone Company, Bridgeport, Conn., has let a contract for the erection of a reinforced concrete building, 60 x 330 ft., five stories.

The Brown Bag Filling Machine Company, Fitchburg, Mass., has awarded a contract for a concrete building, 55 x 76 ft., five stories.

The New England Westinghouse Company will increase the capacity of its Page-Storms plant, Chicopee, Mass., by building a drop forge shop, 75 x 150 ft., one story, and a die shop, 40 x 100 ft., two stories.

The United States arsenal at Watertown, Mass., is to be increased by the erection of a press shop, 115 x 284 ft., one story.

The new buildings at the Waterville, Me., shops of the Maine Central Railroad are approaching completion. The machine shop is 76 x 300 ft., 40 ft. high, and the paint shop is 22 x 79 ft., one story.

The Atlantic Wire Company, Branford, Conn., plans to erect a building 45 x 300 ft., two stories.

The Cushman Chuck Company, Hartford, Conn., is to build an addition, 30 x 70 ft., one story, to its office building.

The Max Ams Machine Company, Bridgeport, Conn., is building an addition, 34 x 104 ft., 20 ft. high.

The project of building a plant at Lawrence, Mass., for the Victor Typewriter Company, New York City, has been abandoned and the factory will be located at Poughkeepsie, N. Y. The building will be 70 x 750 ft., four stories, and its reported cost is to be $1,500,000. The plans, it is understood, call for a complete power plant.

The Waterbury-Farrel Foundry & Machine Company, Waterbury, Conn., is reported to be asking bids for an addition to its plant.

The Remington Arms-Union Metallic Cartridge Company, Bridgeport, Conn., has been granted a building permit for a brick structure, 50 x 210 ft., one story.

The New London Ship & Engine Company is asking bids on a concrete foundry building, 85 x 175 ft., one story.

## Baltimore

BALTIMORE, MD., Oct. 4, 1915.

The Charles L. Stockhausen Company, Marine Bank Building, Baltimore, has been awarded a contract for the construction of a two-story concrete building, 75 x 275 ft., for the Baugh Chemical Company, Eleventh and Clement streets, Canton, Md. It will be used as a sulphuric acid plant and will cost about $40,000.

Bids for the construction of a building 40 x 110 ft. with a wing 40 x 40 ft have been received by the Virginia Products Company, Third Avenue and Eighth Street, Canton, Md. The building will be one-story and will be used as a refinery and storehouse. Parker, Thomas & Rice, architects, Union Trust Building, Baltimore, have prepared the plans.

Work on an immense war munitions plant at Texas, Md., for the Poole Engineering & Machine Company, Woodberry, Md., will begin within the next few days, it is stated.

A crane of 150 tons capacity will be installed at the plant of the Harlan & Hollingsworth Corporation, Wilmington, Del.

A large addition will be built to the engine erection shops of the Norfolk & Western Railroad at Roanoke, Va.

## Chicago

CHICAGO, ILL., Oct. 4, 1915.

The National Steel Products Company, Cedar Rapids, Iowa, will move its plant to East Moline, Ill.

The Barber-Coleman Company, Rockford, Ill., will erect an addition to its plant.

The Havana Metal Wheel Company, Havana, Ill., will erect a new steel and concrete building, 118 x 144 ft., to cost about $25,000.

The Western Cartridge Company, East Alton, Ill., has plans for the equipment of a large new factory on a 400-acre site which it has optioned at Bethalto, Ill.

The Hubbard Woods Motor Car Company, Hubbard Woods, Ill., has been incorporated with a capital stock of $15,000 by F. J. Haarth, August C. Pearson and William N. Schneider.

Marathon, Iowa, has voted $12,000 bonds for an electric lighting plant.

The Keokuk Industrial Association, Keokuk, Iowa, has announced that a factory costing $90,000, which will manufacture raw steel for the Pittsburgh, Gary and South Chicago markets, will be built in Keokuk at once.

The Weber Engine Company, Washington, Iowa, has been incorporated with a capital stock of $60,000 to manufacture farm engines, tractors and other machines. S. W. Livingston is president.

Poplar Grove, Ill., will receive bids until 11 a. m., Oct. 12, for a motor and air compressor for its pumping station. I. S. Reene is village clerk.

P. J. Sandberg, Magnet, Neb., is planning to purchase supplies and material for an electric light and water plant.

Tekamah, Neb., will build a new power house for its electric lighting plant and will purchase one 150-hp. Corliss steam engine, two boilers, one 100-kw. generator and switchboard. F. A. Hassum is mayor.

## Indianapolis

INDIANAPOLIS, IND., Oct. 4, 1915.

The Loco Light Company, Indianapolis, has been incorporated with $10,000 capital stock to manufacture locomotive headlights. The directors are Robert H. Pyle, Lewis J. Isbell and Arthur R. Baxter.

The Universal Envelope Sealer Company, Indianapolis, has been incorporated by Calvin F. Smith, John R. Stephens and William P. Mitchell with $10,000 capital stock to manufacture an envelope sealing device.

The Riser Mfg. Company, Indianapolis, has been incorporated with $10,000 capital stock to manufacture locks. Daniel T. Riser, R. R. Riser and A. J. Helms are the directors.

The Keystone Pump Company, Indianapolis, has been incorporated with $10,000 capital stock to manufacture pumps. The directors are A. M. Hall, E. W. Harris and J. W. McCloud. It will manufacture oil and gasoline pumps.

The Carthage Board & Paper Company, Carthage, Ind., has been incorporated with $150,000 capital stock to manufacture boxboard and paper. The directors are W. P. Holliday, W. J. Henley, Jr., and S. O. McCarty.

The Hercules Gate Company, Grenecastle, Ind., has dissolved.

The Martinsville Ignition Company, Martinsville, Ind., has been incorporated with $10,000 capital stock to manufacture electrical appliances. The directors are Fred L. Wiltshire, C. S. Cunningham and Karl I. Nutter.

The Union Automobile Company, Auburn, Ind., has been incorporated with $100,000 capital stock to manufacture automobiles. The directors are C. M. Brown, John Zimmerman and W. H. Schaab. A plant has been leased.

A. L. Brockssmith, superintendent of the Bicknell Light & Power Company, Bicknell, Ind., is organizing a company with $1,000,000 capital to build a light and power plant at Apraw Falls. It is proposed to provide power for coal mines.

The Charde Lathe Company, Newcastle, Ind., has filled a carload order for Milan, Italy. It has a year's business ahead on its books.

The Globe Engineering Company, South Bend, Ind., has been incorporated with $10,000 capital stock to manufacture mechanical specialties. The directors are Harry B. Snell, W. Howard Edwards and Harvey F. Rositer.

The Evansville Tool Works, Evansville, Ind., has received from an Eastern house a contract for 35,000 bill hooks and 15,000 hand axes.

Fire, originating in the boiler room, caused a loss of $7,000 at the plant of the Ferguson Packing Company, Elwood, Ind., Sept. 29.

Sheron Brothers drain tile factory, West Marion, Ind., was destroyed by fire Sept. 29 with a loss of $15,000.

The Industrial Supply Company, Brazil, Ind., has been organized to take over the mine steel supply jobbing business of the Crawford & McCrimmon Company. It will occupy the factory recently vacated by the Crawford & McCrimmon Company, which has moved to larger quarters. The new organization has $10,000 capital stock. The dierctors are: J. H. McClelland, W. W. Winslow, J. C. Sims, M. H. Johnson, Sr., and B. F. Crawford. Mr. Crawford is president and Mr. Sims secretary of the company. Harley Ireland is treasurer.

The Crawford & McCrimmon Company, operating a foundry and machine shop, Brazil, Ind., has a contract which will keep its plant in operation on full schedule for a year.

The Wood Tilted Turret Lathe Company, Brazil, Ind., has booked some large orders for supplying railroad shops in Australia and New Zealand with lathes. Its plant is working two shifts, besides sub-letting work to two other local companies.

The Hill-Tripp Pump Company and the Hill Machine Company, Anderson, Ind., have been merged into the Hill Pump Company with $250,000 capital. The officers are: President, George B. Ayres; vice-president, Hugh Hill; treasurer, Forrest Hill; secretary, Ernest Hill. The company has business for a year ahead, and is working a day and night shift.

The Hawkes Electric Company, Goshen, Ind., is building a duplicate plant to cost $40,000 near its present site.

The Goshen Lightning Rod Company, Goshen, Ind., is building an addition to its plant.

Bids will be received until Oct. 12 by F. L. Miner, city clerk, Monticello, Ind., for two duplex pumps, valves, etc.

## Milwaukee

MILWAUKEE, WIS., Oct. 4, 1915.

Jobbers and retailers report an unprecedented demand for mechanics' and machinists' tools. Purchases are the largest in years. This is due to the employment of all available labor in the machine shops of the city and State. Machine-tool builders continue to operate at full capacity. Bookings of prime movers continue to swell, although no purchases of special note are reported. The total, however, is of satisfactory proportions, when it is considered that for more than 18 months hardly anything in this line was called for.

Armin A. Schlesinger, vice-president Milwaukee Coke & Gas Company, Milwaukee, and interested with Ferdinand Schlesinger, in numerous iron-ore, furnace and coke interests, appears as principal incorporator of the Western Coke Company, St. Paul, Minn., which is about to invest $1,500,000 to $2,000,000 in a coke and gas works in that city.

The Sterling Motor Truck Company, Forty-sixth Avenue and Rogers Street, West Allis, Milwaukee, has awarded contracts for a factory addition which will practically double its capacity. Klug & Smith, consulting engineers, Milwaukee, are in charge.

L. J. Knickerbocker, Hartford, Wis., will erect a garage and machine shop, 55 x 80 ft. The greater part of the building will be leased by the Hartford Tire Pump Company, manufacturer of compressors for automobiles. Welding apparatus will be installed.

The Modern Grinder Mfg. Company, Milwaukee, has been incorporated with a capital stock of $10,000 by Charles and Tony Cohn and Ely Bockshe to manufacture portable and stationary grinding machines and other machine shop devices.

The J. B. D. Holding Company, Milwaukee, has been organized with a capital stock of $3,000 by Peter Lesch, Dan E. Deuster and J. B. Drakonorsky to manufacture steel and ball-bearing wheels for motor vehicles.

The new plant of the Westinghouse Lamp Company, Milwaukee, subsidiary of the Westinghouse Electric Company, is expected to commence operations this week. Frank M. Wicks has been appointed manager.

The Gold Medal Camp Furniture Company, Racine, Wis., is erecting an addition, four stories, 71 x 102 ft., of brick construction.

The Dicke Motor Car Company, Manitowoc, Wis., has broken ground for a garage and machine shop, of brick and steel, 60 x 120 ft., one story and basement.

The Daylight Hardware Company, Stoughton, Wis., has been incorporated with a capital stock of $25,000 by George H. and Mildred J. Thompson and J. F. Melaas.

The Graf Stove & Range Company, Louisville, Ky., will relocate its works at Silver Lake, Kenosha County, Wis., near the junction of the Chicago & Northwestern and Soo lines.

Plans for the new works of the Hamilton-Beach Mfg. Company, Racine, Wis., manufacturer of small electric-motor appliances and specialties, are being completed by E. B. Funston, architect, Racine. The building will be of brick and steel, fireproof construction, three stories, 50 x 300 ft., and two stories, 40 x 100 ft. Fred C. Osius is general manager.

The Wisconsin Bridge & Iron Company, Milwaukee, Wis., will build a foundry, 80 x 270 ft.

The Milwaukee Auto Engine & Supply Company has increased its capital from $6,000 to $30,000 and will build an addition.

The Felker Mfg. Co., Marshfield, Wis., is building an addition to its plant.

The International Wire Works, Menasha, Wis., has been incorporated with a capital stock of $25,000 by J. M. Braunn, J. M. Groef and W. A. Lemke.

Leo Smith, formerly general manager of the Prime Steel Company, Milwaukee, is completing plans for the operation of an electric steel foundry in that city.

Sale of the Prime Steel Company works to Harris Brothers, Chicago, has been announced by the court. The plant will be resold either in parcels or as a whole.

## Detroit

DETROIT, MICH., Oct. 4, 1915.

The past month has been highly satisfactory in local trade circles; the demand for machine tools, both new and second hand, has been steady and sales run into a pleasing total. Nothing of noteworthy interest has developed the past week in either sales or inquiries, but there has been a fine run of both. No large lists are appearing. In special lines perhaps electrical equipment is exhibiting the greatest activity, although handling equipment is also moving fairly well. Foundry products are in excellent demand and plants are well engaged. Building operations of the larger class are somewhat below normal.

The Detroit Steel Products Company, Boulevard and Chene Street, Detroit, is adding a one-story steel frame addition, 52 x 126 ft., at a cost of about $10,000.

The King Motor Car Company, Detroit, has purchased the four-story factory formerly occupied by Knell & Adams. It contains about 70,000 sq. ft. of floor space and will enable the company to enlarge several departments.

The Disco Electric Starter Company, Detroit, manufacturer of automobile starters, has increased its capital stock from $60,000 to $100,000.

The Thelma Motor Company, Detroit, will remove to Ecorse, a Detroit suburb, where it has purchased the plant of the Potter Boat Company. The company manufactures marine motors and will increase its production.

The Jefferson Aluminum Works, Detroit, has been incorporated with $10,000 capital stock to manufacture aluminum ware. The incorporators are Frederick A. Cann, Frank R. Petz and Calvin C. Terry.

The General Mfg. Company, Detroit, has been incorporated with $5,000 capital stock by Harry Wild, C. W. Olson and C. R. Robertson. It will manufacture automobile accessories.

The Hudson Motor Car Company, Detroit, has acquired a tract of three acres adjacent to its present plant and will erect a new power plant thereon. Room is also provided for future expansion.

The Manistee Iron Works, Manistee, Mich., has awarded contracts for two additions to its plant, which comprise a cupola room, 30 x 32 ft., and a core oven room, 20 x 30 ft. Electrically driven equipment, including a crane and blower, will be installed.

The Bradley & Ankebrant Company, Muskegon, Mich., manufacturer of cast-iron plumbing and steam goods, is completing a new plant, which includes a machine shop, 40 x 60 ft.; foundry, 60 x 100 ft., and a one and two-story cupola room. Modern equipment is being installed.

The Consolidated Press Company, Hastings, Mich., has begun the erection of its new plant, to be 150 x 300 ft., three stories. The machinery will be electrically driven and the building will be served by a 50-ton crane and several smaller ones. An office building, 50 x 100 ft., will also be erected.

The Monroe Motor Company, Flint, Mich., manufacturer of automobile motors, has increased its capital stock from $250,000 to $375,000.

The Detroit-Wyandotte Motor Company, Wyandotte, Mich., has been reorganized, reducing its capital stock from $300,000 to $100,000.

The Auto Body Company, Lansing, Mich., has begun the erection of an addition to its plant.

The Atlas Drop Forge Company, Lansing, Mich., will enlarge and improve its plant, $50,000 having been appropriated for that purpose. The nature of the improvements has not been announced.

The Hayes Truck Wheel Company, St. Johns, Mich., has been incorporated with $100,000 capital stock to manufacture wheels for automobile trucks. A factory has been secured and is being remodeled. C. B. Hayes, Jackson, Mich., is head of the company.

The Republic Motor Truck Company, Alma, Mich., has increased its capital stock from $250,000 to $500,000.

The American Malleable Company, Owosso, Mich., has completed plans for an addition to its plant to cost approximately $60,000 and will double its capacity.

McBain, Mich., has voted $94,000 in bonds for a new waterworks system.

The Hartley Steel Crated Box Company, Saginaw, Mich., has been incorporated with a capital of $100,000 to manufacture merchandise specialties by G. W. Hartley, A. W. Seeley and E. E. Gullinger.

The Citizens Electric Company, Battle Creek, Mich., is erecting a generator room, 44 x 60 ft., and an addition to the boiler room, 42 x 60 ft., at a cost of over $30,000.

The W. E. Dunn Company, Chicago, manufacturer of concrete mixers and oil engines, will locate a factory at Holland, Mich.

The Alma Standard Foundry Mfg. Company, Alma, Mich., will move its plant to Saginaw, where it will build a large new foundry.

The addition to the Motor Specialty Company's plant at Muskegon, Mich., consisting of a boiler room and machine shop, is nearing completion and it is understood that a number of new machines will be installed.

## Cleveland

CLEVELAND, OHIO, Oct. 5, 1915.

No falling off in the demand for machine tools is apparent. Many inquiries for turret lathes are out for early delivery but as builders cannot make shipments desired little business is being placed. Improved conditions in the bolt and nut trade are reflected in a good demand for bolt machinery. Local machinery houses are getting a good volume of small orders from scattering sources. They are readily disposing of all the machinery they are getting on stock orders and could sell more were they able to secure it. Plant extensions continue with more in prospect, and engineering firms are crowded with work. Conditions in the foundry trade are good, most local plants having about all they can do.

The Warner & Swasey Company, Cleveland, will further extend its plant by the erection of a five-story brick and steel building providing 75,000 sq. ft. of floor space to be used for storage and shipping purposes.

The Canton Steel Foundry Company, Canton, Ohio, is enlarging its plant and will install additional equipment. The improvements include two core and two drying ovens, gas engines and electrical equipment. One open-hearth furnace will be rebuilt.

The Atlantic Foundry Company, Akron, Ohio, is building an addition that will increase its capacity about 50 per cent.

The Bright Circle Mfg. Company, maker of vacuum cleaners, has removed its plant from San Francisco to Toledo, Ohio, where it has taken quarters in the Toledo Factories Building.

The Willys-Overland Company, Toledo, Ohio, will add one story to a steel building and a 60-ft. extension to another factory.

The Monroe Building Company, Toledo, Ohio, will erect a steel building 90 x 166 ft., for manufacturing purposes.

A factory will be erected in Toledo, Ohio, by the Non-Rewind Film Reel Company which has been incorporated with a capital stock of $50,000 to manufacture reels for moving picture films.

The plant of the Tayson Rubber Company, Wooster, Ohio, has been purchased by the Kelly-Springfield Company, Akron, Ohio, and will be used for the manufacture of automobile tires.

The American Hay Car Company, Hicksville, Ohio, has been organized with a capital stock of $30,000 to build hay cars. It is stated a plant will be equipped shortly.

The Dunham Company, Berea, Ohio, maker of farm machinery and specialties will enlarge its plant by the erection of a steel and concrete building, about 100 x 185 ft.

It is announced that the plant of the H. Clauss Mfg. Company, Fremont, Ohio, maker of shears, cutlery and razors, will probably be moved to Tipton, Ind., where a modern factory will be erected.

The Hinds Money Sorter Company, Marion, Ohio, has been organized with a capital stock of $30,000 to manufacture a machine for sorting coins. Henry Ohls, James H. Eymon and others are interested.

East Liverpool, Ohio, has received bids for a $375,000 municipal waterworks plant.

The Cincinnati Screw Company, Twightwee, Ohio, manufacturer of machine screw products, has purchased the plant and equipment of the Cincinnati Screw & Tap Company, consisting of over 100 automatic screw machines, and will put the plant in full operation within a few days.

## The Central South

LOUISVILLE, KY., Oct. 5, 1915.

Business in machinery lines continues at a fair pace, but large orders are reported to be rather scarce, the volume being supplied chiefly by demands of a minor character. A moderate amount of boiler business is offered, but manufacturers report that, in spite of advances on material, quotations submitted to buyers are as low or lower than they have been for a long while. Anxiety to keep their plants operating is given as the explanation for the low prices. Electric motor manufacturers find the trade quiet. Machine tools are in good demand, and stocks in manufacturers' warehouses are badly broken. General business conditions remain satisfactory.

The Waterford Canning Company, Waterford, Ky., will add equipment for manufacturing flour.

The Bluegrass Motor Company, Carlisle, Ky., is reported in the market for equipment for an automobile repair shop. Address M. T. Ruddell.

The Koehler Brothers-Fowler Construction Company, 68 West Court Avenue, Memphis, Tenn., is in the market for a second-hand steam shovel.

The Oliver-Hill Construction Company, Bank & Trust Building, Knoxville, Tenn., will purchase a number of revolving steam shovels, new or second-hand.

The G. W. Simmons Company, 89 South Front Street, Memphis, Tenn., is asking for prices on a Defiance or Hoyt Brothers axle turning lathe, second-hand. It will also purchase a vertical or horizontal cornmeal and feed grinder.

The Economy Heating & Lighting Company, Nashville, Tenn., is planning the manufacture of gasoline heating and lighting equipment. Address L. R. Jarrett, manager, 807 Church Street.

The Western Hospital for the Insane, Bolivar, Tenn., will replace its buildings recently burned, and will be in the market for power-plant, laundry, ice-making and other machinery. A dynamo for operating the electric light system will also be needed.

Noel & Co., Nashville, Tenn., will equip a cold-storage plant at an estimated cost of $5,000.

Knoxville, Tenn., is planning a $500,000 bond issue for improving the municipal water system.

The Hill Ice Cream Company, Chattanooga, Tenn., will erect a manufacturing building and install power and special equipment. The capitalization has recently been increased from $10,000 to $40,000. S. Hill, 1273 Market Street, is president.

The Warner-Klipstein Chemical Company, Charleston, W. Va., has been incorporated with $500,000 capital stock and will build a plant at South Charleston. E. C. and E. H. Klipstein, connected with the chemical house of A. Klipstein & Co., New York, are interested.

The Royal Block Coal Company, Madison, W. Va., is in the market for electric power equipment for operating its cutting and hauling machinery. S. E. Bradley is president.

Mineral, Va., plans the establishment of an electric light plant and water system. The mayor can give details.

The Willard Storage Battery Company, Cleveland, Ohio, has leased a building at 10 East Cain Street, Atlanta, Ga., which will be equipped for charging electric storage batteries.

The mill of the Usher Brothers Lumber Company, Meridian, Miss., was recently burned with a loss of $60,000.

The commissioners of the port of New Orleans, La., will receive bids until Oct. 13 for furnishing and installing a 100-kw. and 200-kw. motor generator set, equipment for series circuit and switchboard for cotton warehouses and terminal on the Mississippi River. Ford, Bacon & Davis, 921 Canal Street, New Orleans, are the engineers. Ernest M. Loeb is president of the board of commissioners.

## Birmingham

BIRMINGHAM, ALA., Oct. 4, 1915.

A demand for machine tools, which cannot be filled owing to an excess of orders on the books of manufacturers, is the feature of the wholesale machinery trade. All second-hand tools have been disposed of at good prices and the market could absorb more. Electrical equipment for mines, mills and small factories is active. General business conditions continue to improve.

The Roofing Products Company, Birmingham, has been incorporated with a capital stock of $10,000 by F. Larkin, H. W. Stansbury, H. W. Thweatt, and others, to manufacture roofing material.

The Lerio Patent Cup Company, Mobile, has been incorporated by Louis Lerio, R. E. Williams, and others, to manufacture turpentine cups. The capital stock is $5,000.

T. B. Nobles, Attalla, Ala., expects to build a planing mill.

Mexican Petroleum Company, 52 Broadway, New York, will build a distributing plant consisting of tanks, pipe lines, etc., in Savannah, Ga., for storing of oil from tank steamers.

The Tucker Brick Company, Kissimee, Fla., will at once build a factory for making paving brick from sawdust. An expenditure of $50,000 is contemplated.

## St. Louis

ST. LOUIS, MO., Oct. 4, 1915.

Machine-tool business is steadily working toward normal. Business is of small lot and single tool character. Dealers have difficulties in delivery caused by the earlier orders from other sections for equipment to be utilized in war munitions manufacture. Reports from the South and Southwest are of increasing interest in industrial investments and of new plants contemplated as well as enlargements. Financial conditions are reported the best in the history of these sections.

The Hyke Brothers Mfg. Company, St. Louis., Mo., has been incorporated with a capital stock of $100,000 by G. F., Fred and Albert L. Hyke to operate a metal-working plant for which machinery is needed.

The Superior Iron & Furnace Company, St. Louis, Mo., has been incorporated with a capital stock of $100,000 by A. Alfred Laurie, C. A. Burton and W. H. Belt to operate a blast furnace.

The Drey Automatic Glass Machine Company, St. Louis, Mo., has been incorporated with a capital stock of $200,000 by Leo A. Drey, David Sommers, Herman Frank, Edward F. Slevin and M. H. Levy.

The Commercial Auto Body Company, St. Louis., Mo., has acquired additional space for the manufacture of automobile bodies and will install some new equipment. Hugh F. Cartright, 3003 Locust Street, should be addressed.

The Diamond Motor Company, St. Joseph, Mo., has increased its capital stock from $2,500 to $15,000.

The Joplin Motor Company, Joplin, Mo., has been incorporated with a capital stock of $10,000 by Ray Rinehard, Ivan A. Low and M. I. Molley and will equip a machine and repair shop.

The St. Mary's Oil Engine Company, St. Charles, Mo., has been incorporated with a capital stock of $300,000 by J. D. Anderson, Louis F. Marten and John H. Steinbrinker to manufacture oil engines.

The Campbell Electric Light & Power Plant, Campbell, Mo., recently incorporated, will install equipment of a cost of about $17,500, developing about 200 hp.

Columbia, Mo., will increase the capacity of its electric plant.

The Oklahoma Consolidated Lead & Zinc Corporation, Central National Bank Building, Joplin, Mo., is in the market for equipment for handling about 500 tons of ore per shift.

The Porter Electric Incubator Company, Kennett, Mo., has been incorporated with a capital stock of $16,000 by Lee Shelton, Theo. Robb and B. C. Porter to manufacture a patented device.

The North Arkansas Utilities Corporation, Corning, Ark., has been incorporated with a capital stock of $75,000 by George A. Booser, C. L. Daniel, H. B. Hays and others, and will equip at the start a turbine electrical generating unit to cost about $20,000.

The Arkansas Light & Power Company, Arkadelphia, Ark., has acquired the electric and water plants at Morrilton, Ark., and will add equipment. Inquiries are now being made for 500 and 350-kw. horizontal turbine generators.

Two hardwood lumber mills will be equipped near Arkadelphia, Ark., by J. T. Knowles and others, representing the Pioneer Pole & Shaft Company.

The Moore Crate Company, Bald Knob, Ark., has been incorporated with a capital stock of $10,000 by R. P. Moore, W. B. Beckwith and T. J. Campbell.

The Cleveland Brick Company, Cleveland, Okla, has been incorporated with a capital stock of $75,000 by G. W. Sutton, J. B. Myres and I. D. Gould.

The city of Soper, Ark., will expend $6,000 for electric light and power generating equipment.

Cosden & Co., Tulsa, Okla., will equip a plant to cost about $200,000 for the manufacture of oils, wax, etc.

A combination shop and roundhouse will be built and equipped at Ardmore, Okla., for the Oklahoma, New Mexico & Pacific Railway. W. J. Stoneburner is general superintendent.

The National Coop & Box Company, Lake Charles, La., has been organized by S. A. Cummings and others and will install wood-working equipment for the manufacture of 1000 folding crates per day.

The Merchants Broom Mfg. Company, Lafayette, La., has been incorporated with a capital stock of $50,000 by Charles N. Thibodeaux, Alfred Hebert, Albert J. Alleman and others.

The Western Tablet Company, St. Joseph, Mo., is planning improvements to its plant which will involve an expenditure of about $30,000, two-thirds of which is for new machinery.

## Texas

AUSTIN, TEX., Oct. 2, 1915.

Business conditions generally continue to show an improvement, due largely to the high price of cotton and cotton seed. An unusually large amount of building improvements is planned for the next several months.

The Southwestern Traction Company is surveying the route of its proposed interurban electric railway between Dallas and Stephenville. The plans involve the building of power stations. E. P. Turner, Dallas, is president.

The Houston Oil Company, Houston, plans to build one or more large lumber mills upon its extensive tract of timber land in eastern Texas, which embraces approximately 800,000 acres.

J. S. Curtis, El Paso, and associates, will build a plant for the manufacture of waterproof fulminating mining cap protectors. W. H. Wilson, Denver, Col., will be manager.

The International & Great Northern Railway will build its proposed new shops and roundhouse just south of San Antonio, Tex., and it is understood that construction will be started soon.

## The Pacific Northwest

SEATTLE, WASH., Sept. 28, 1915.

Little movement is reported in metal-working tools. It looks as if there would be a strong demand as soon as the present abnormal conditions in producing markets pass away, as many prospective buyers are holding back in hope of more favorable terms later. Miscellaneous lines of machinery show little change, but confidence in the outlook is increasing. The implement trade is keeping up exceptionally well for this time of year, tractors and other farm equipment using mechanical power being increasingly popular. Mining machinery also continues to move well, and some important orders have been placed for smelting equipment. A number of lumber mill fires have brought out orders for replacement, and the routine trade in this line is of considerable importance though below normal. Contractors' machinery in general, and heating units, elevators, etc., connected with building operations, are getting slightly more attention after being quiet for a long time. The unfortunate shipping conditions continue. Were bottoms available, a large amount of offshore lumber business could be handled, which, under present conditions, cannot be taken advantage of.

The Copper River & Northwestern Railway Company, Alaska, has ordered for immediate shipment from Seattle mills more than 1,000,000 ft. of lumber, to be used in construction of snowsheds and repair work. It has placed orders in the past few weeks for more than $100,000 worth of equipment and machinery. Seattle manufacturers will be busy with this order for the next sixty days. The railroad company is making extensive preparations to handle the large output of copper ore from the Kennicott mines.

The Southern Pacific roundhouse at Weed, Cal., was destroyed by fire Sept. 21, the loss including a small amount of machinery and shop equipment.

M. R. Cummings, Portland, of the Castle Rock Briquet Company, is preparing to begin construction of a briquetting plant at the coal mine near Castle Rock, Wash.

The Overlook Mining Company, Prescott, Wash., is figuring on the construction of a hydroelectric plant, etc.

The Farmers Pump Company, Vancouver, Wash., has been incorporated with a capital stock of $32,000 by F. M. Lockwood, R. C. Sugg, and others, to manufacture pumps and other machinery.

The Pacific Furniture Specialties Mfg. Company, Inc., East Twenty-seventh and Morgan streets, Portland, Ore., is

installing machinery and will be ready for operation about Oct. 15. Victor Wierzba will be superintendent.

The R. M. Turner Company, Spokane, Wash., has filed articles of incorporation, with authorized capitalization of $100,000. Ross Turner, Catherine Turner and Frank Bowers are the incorporators. It will erect a plant for the manufacture of toilet articles.

The J. B. Long Lumber & Shingle Mill Company's plant at Sequim, Wash., was completely destroyed by fire, with a loss of about $6,000. It will be rebuilt at once.

The Deer Creek Milling & Mining Company, Lewiston, Idaho, plans the construction of a steam plant, including a boiler and engine.

The Automatic Oil Gauge Company, Seattle, Wash., has filed articles of incorporation, with capital stock of $100,000. N. J. Veline and L. D. H. Adams are the incorporators.

The plant of the Lindstrom-Hanforth Lumber Company, Rainier, Wash., near Tacoma, was completely destroyed by fire Sept. 23, with a loss of more than $100,000. The buildings destroyed include a shingle mill and a sawmill.

The O'Connor Universal Locknut Company, Wallace, Idaho, has filed articles of incorporation with a capital stock of $100,000. C. D. O'Connor, J. D. Foster and R. E. Weniger are the incorporators. It is understood it will erect a plant.

Morris Martin, Seaside, Ore., and associates, have leased property on which will be erected a fireproof garage and machine shop, 100 x 110 ft. It will be equipped with lathes, milling machinery, drill presses, etc.

The Yakima Central Heating Company, North Yakima, Wash., has increased its capital stock to $50,000, it is understood, for making necessary improvements to its plant.

George W. Onn, Tacoma, Wash., plans the erection of a sawmill near Centralia, Wash., of 40,000 to 50,000 ft. daily capacity.

The Chamber of Commerce, Lewistown, Mont., is negotiating with the Union Products Company, a New Jersey corporation, which plans the establishment of a manufacturing plant there under the management of C. W. Tuttle, Corning, Iowa, who is now securing a site. The company will manufacture a variety of farm implements.

The sawmill plant of the Lebanon Lumber Company, Lebanon, Ore., was destroyed by fire recently, with a loss of more than $80,000. The mill, light and power plant, which had recently been granted franchise to furnish the city with light and power, was also burned. P. M. Scroggin, owner and president of the company, is uncertain whether the mill will be rebuilt or not.

The Erz Automatic Lock Company, Bellingham, Wash., has recently been incorporated for $30,000, by George Erg, A. Lobe and W. R. Brown.

The Bonners Water & Light Company, Bonners Ferry, Idaho, plans a water system to cost about $15,000.

C. C. Welderman, Pocatello, Idaho, has recently leased the Smedley brick plant in that city and put it in operation. It will be completely overhauled next spring and new machinery installed.

The first unit of the plant of the Spokane Stockyards has been completed at a cost of $75,000 and W. D. Roberts, president of the company, announces that work will be pushed until the entire project has been finished, with an ultimate cost of $470,000.

The Town Council of Terry, Mont., has granted L. H. Gaffney a franchise to install and operate an electric lighting plant.

The Independent Meat Company, Twin Falls, Idaho, is to start work at once on a new packing plant to cost $15,000.

The Holton Power Company, El Centro, Cal., will build an addition to its ice plant to cost from $60,000 to $75,000.

## Government Purchases

WASHINGTON, D. C., Oct. 4, 1915.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Oct. 12, Schedule 8824, for 15 valve reseating machines for Brooklyn; until Oct. 26, Schedule 8830, for one automobile disk press for Mare Island.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, Sept. 21, schedule 8741, steam engineering, class 41, for one boring and turning mill for Boston—Kemp Machinery Company, $2,140; Niles-Bement-Pond Company, $2,810; on Sept. 28, schedule 8731, construction and repair, class 51, for one pneumatic yoke riveting machine and one valve for Mare Island—Richard H. Grey, $49.50, part; Vulcan Engineering Sales Company, $1,380.60 and $1,495.60.

## Canada

TORONTO, Oct. 2, 1915.

Steel companies and manufacturing plants in Canada which have received orders from the Dominion Government for the manufacture of shells, boxes, ammunition, etc., are experiencing a decided improvement in trade conditions. Practically all the companies have installed new machinery or are doing so. It is expected that orders for the manufacture of heavy guns will be placed in Canada in the near future when it will be necessary for the plants to install new machinery adapted for the manufacture of guns. On account of the scarcity of mechanics the companies are compelled to work overtime.

It is reported from Ottawa that orders for the manufacture of heavy guns to cost $50,000,000 will shortly be placed in Canada by the British Government, of which D. A. Thomas is a representative. It is also stated that new shell orders aggregating $80,000,000 are coming to Canada. These orders are for shells of a much larger type than have been manufactured here up to the present, calling for 9.2 and 12-in. shells. The shell factories of Canada have increased their output by 200,000 a month, and are now producing 800,000 shells a month, and will use 170,000 tons of steel on the new orders.

The Union Twist Drill Company, Sherbrooke, Que., has let contract to Loomes & Dakin, Sherbrooke, for the erection of an addition to its plant at Rock Island, Que.

A large addition is being made to the Norton Works at Chippewa, Ont., for the manufacture of abrasives, etc.

The Northern Boat & Scow Company, Owen Sound, Ont., has purchased the plant of the Dominion Boat Works, Toronto, and will remove it to Owen Sound.

B. T. Rogers will build a machine shop to cost $25,000 on Granville Street, Vancouver, B. C.

The Guelph Carriage Top Company, Guelph, Ont., is in the market for a 50 hp. to 80 hp. engine.

Brousseau & Frere, St. Paul Street, Quebec, are receiving prices on steam pumps, steam boilers, etc.

J. Whiteley, Trenton, Ont., is in the market for woodworking machinery, etc.

The City Council of Fort William, Ont., decided that in view of the existing financial conditions it would grant a reasonable extension of time for the completion of the plant of the Conley Frog & Switch Company which is being erected there. John E. Conley, Memphis, Tenn., is president.

R. V. Winch & Co., Ltd., Winch Building, Vancouver, B. C., is in the market for one steam-driven air compressor of from 325 to 400 cu. ft. of air per minute with receiver, etc.

The Canadian Cartridge Company, Ltd., Toronto, has been incorporated with a capital stock of $400,000 by Reginald H. Parmenter, 93 Dunvegan Road; William S. Morlock, Arthur J. Thomson and others to manufacture shells, rifles, ammunition, etc.

The Saskatchewan Harness Company, Ltd., Prince Albert, Sask., has been incorporated with a capital stock of $30,000 to manufacture leather, etc.

The Canadian Detroit Lubricating Company is erecting a factory at Walkerville, Ont.

Additions to cost $10,000 will be made to the plant of the Kelsey Wheel Company, Windsor, Ont.

George Gordon & Co., Cache Bay, Ont., is in the market for two double cutting band mills, one horizontal resaw, together with edgers, lath mills, trimmers, etc., to be installed in a mill to be built at Cache Bay at a cost of $75,000.

M. L. F. Germain, St. Andre De Kamouraska, Que., will build a factory for the manufacture of scales, etc.

Gray & Dunn, 14 St. John Street, Montreal, has received the contract for the erection of a factory to cost $9,000 for the Bedford Mfg. Company, Bedford, Que. Saw and lathe equipment will be purchased by F. D. Welsh, manager.

The France & Canada Steamship Company, Ltd., Montreal, has been incorporated with a capital stock of $1,000,000 by William J. Shaughnessy, Henry H. Scott, Ernest G. Bennett and others to build and operate steamships, docks, drydocks, etc.

The Harris Heating & Engineering Company, Ltd., Montreal, has been incorporated with a capital stock of $25,000 by Joseph A. Harris, Louis A. Desy and others to manufacture metal, machinery, tools, etc.

The Castings Company of Canada, Ltd., Montreal, has been incorporated with a capital stock of $49,000 by Harry Cohen, Alexander Ellison, of Montreal; Stanley G. Metcalfe and Joseph L. Valentine of Ottawa, Ont., and others to manufacture castings, ammunition, shells, etc.

The Sorel Steel Foundries Company, Ltd., Sorel, Que., has been incorporated with a capital stock of $100,000 by Louis P. Tremblay of Sorel, Joseph A. Barrette, St. Barthelemi, Que., Oscar Coderre, Ottawa, Ont., and others to manufacture castings, etc.

The Lindsay Factories, Ltd., Toronto, has been incorporated with a capital stock of $50,000 by George E. Lindsay, Maitland Phelps, 95 Bertmount Avenue; Thomas W. Horn and others to manufacture iron, steel, etc.

The Darlington Gravel Company, Ltd., Bowmanville, Ont., has been incorporated with a capital stock of $40,000 by John B. Mitchel, Bowmanville; George A. Stephens, Darlington, Ont., and others to manufacture concrete blocks, stone, brick, etc.

Benoit & Sons, sash and door factory on St. Timothee Street, Montreal, was totally destroyed by fire with a loss estimated at about $50,000.

William H. Sumbling, 643 Yonge Street, Toronto, is in the market for a number of screw-cutting engine lathes, etc.

The Canadian Box & Shook Mills, Ltd., Sherbrooke, Que., has been incorporated with a capital stock of $50,000 by H. R. Fraser, F. S. Rugg and others to manufacture boxes, etc.

The National Paper Company, Montreal, with mills at Valleyfield, Que., will build a plant to cost upward of $100,000 for the manufacture of coated paper, etc.

A company backed by American capitalists will build a large pulp mill in Temiskaming to cost about $2,000,000. Sutcliffe & Neelands, New Liskeard, Ont., are the engineers.

The National Toy & Novelty Company will establish a plant at Paris, Ont., for the manufacture of toys, etc. Among those interested are I. Bonner, H. Huson, C. E. Walker and others.

## NEW TRADE PUBLICATIONS

**Chucks.**—Westcott Chuck Company, Oneida, N. Y. Catalog N. Second edition of 1915. Illustrations and descriptive matter explain the use and operation of a line of chucks for lathes and drilling machines. The construction of the chucks is gone into at some length and the text is supplemented by illustrations of the various parts. In some cases phantom views of the chucks are presented to show the arrangement of the jaws and the operating parts. The chucks covered include scroll combination, geared scroll combination and universal, independent geared combination and universal lathe chucks and several different types of drill chucks. Mention is made of a line of center arbors that can be supplied for the chucks and a telegraph code is included.

**Eye Protectors.**—Strong, Kennard & Nutt Company, 511 Schofield Building, Cleveland, Ohio. Pamphlet. Describes the Adjustoglas line of eye protectors which have a bridge that is adjustable for width and height as well as for any angle or distance from the face. The various features of the eye protectors are mentioned and brought out in the illustrations and instructions on the adjustment of the protector are included.

**Lathes.**—Foster Machine Company, Elkhart, Ind. Collection of loose leaf circulars. Presents illustrations, brief descriptions and specification tables of plain and geared friction head turret lathes, screw machines and universal and set-over turret lathes. A separate circular is given to each style of machine and brief descriptions of the accessories that can be supplied with the tools are presented on the back.

**Chain Drives.**—Morse Chain Company, Ithaca, N. Y. Publication No. 14. Treats of the Morse Silent Chain for transmitting power and calls attention to the gradual increase in the amount of power that is being transmitted in this way. The larger portion of the pamphlet is given over to illustrations of various drives which include views of a chain drive transmitting 5000 hp. that is considered the largest chain drive in the world, one of 1000 hp. which is probably the second largest installation and a 600-hp. drive in a rolling mill which is the largest of its kind in the world.

**Fuel Oil Apparatus.**—Hauck Mfg. Company, 140 Livingston Street, Brooklyn, N. Y. Bulletin No. 60. Contains illustrations and brief descriptions of various uses of fuel oil burning apparatus in shops of various kinds, foundries, etc. A number of views of the different types of furnaces, forges and torches are also included.

**Molding Machines.**—International Molding Machine Company, Chicago, Ill. Pamphlet. Shows the several types of molding machines which can be supplied. These include a turn-over draw machine operated by foot power, power turn-over power draft, combination jar ramming turn-over draw, power squeezing, combination jolt squeezing, combination stripping squeezing and jarring machines of various types. In connection with the illustrations of the several machines, brief descriptions of the work they are designed to do are presented. Several installation views are included.

**Steel Chains.**—Union Chain & Mfg. Company, Seville, Ohio. Catalog No. 3. Concerned with a line of steel chains for transmitting power and handling material. After giving a number of practical suggestions on the load which the chains should be subjected to, the speeds at which they should be run and the position and design of the sprockets, the construction of the chain is gone into at some length, the text being supplemented by a number of drawings of the various sizes and styles of chains that can be supplied. A special feature of these chains is that the bushings and pins, after they have been worn down to some extent, can be reinserted upside down to bring the unworn surfaces into service and restore the original pitch of the chain. An illustrated description of this chain appeared in THE IRON AGE, Aug. 21, 1913.

**Reinforced Concrete Construction.**—American Concrete-Steel Company, Essex Building, Newark, N. J. Pamphlet. Calls attention to some of the reinforced concrete buildings that have been erected by this company. These include warehouses, factories of various sizes, office buildings, etc. In connection with the engravings of the different buildings a brief statement of the particular features of the contract are given together with brief general statements of the advantages of reinforced concrete work. Mention is also made of the variety of work which the company can handle as well as the organization and the engineering service it is prepared to furnish to architects and owners.

**Internal Combustion Engines.**—John Lauson Mfg. Company, New Holstein, Wis. Catalog No. 18. Pertains to a line of internal combustion engines using gas, gasoline, kerosene and distillate as fuel. In the catalog engravings of the various engines with brief descriptions are presented on the left hand pages, while descriptions of the several parts and their special features are presented on the facing ones. The engines are built in stationary sizes from 2½ to 50 hp. and in portable and semi-portable types from 1½ to 28 hp. as well as heavy duty kerosene engines developing from 35 to 100 hp. Scattered throughout the catalog are a number of illustrations of the engines in actual use for performing a variety of services.

**Automatic Steam Trap.**—McAuley Automatic Trap Company, Imperial Power Building, Pittsburgh, Pa. Catalog. Illustrates a line of automatic traps for gas, steam and compressed air. After a brief description of the traps and the way in which they operate, the various features such as automatic discharge, freedom from concealed working parts and elimination of hollow floats and stuffing boxes are touched upon. A list of users of traps is included. Instructions on the care of the traps in service are presented together with a suggested arrangement for the use of the traps in connection with compressed air.

**Metal Windows.**—Hecla-Winslow Company, Inc., 101 Park Avenue, New York City. Catalog. Describes chiefly by illustrations the construction of a line of windows with metal frames. The various parts are illustrated and diagrams showing how the windows can be adapted to different conditions are included. Instructions for erecting the windows are given and several illustrations of buildings in which they have been installed are presented together with a partial list. The structures in which these windows have been installed include the Equitable Building for which 5016 windows were furnished.

**Shop Equipment.**—Mfg. Equipment & Engineering Company, Boston, Mass. Three pamphlets and a circular. Concerned with a line of shop equipment which includes sanitary bubbling fountains, wash bowls and metal lockers and furniture. All of these are illustrated in some profusion, there being little, if any, text in the literature.

**Drill and Tap Holders.**—Beaman & Smith Company, Providence, R. I. Pamphlet. Presents a brief description of a drill and tap holder consisting of only four parts, the shank and body, cap, socket and check or spanner nut. After the descriptive matter a number of engravings showing the relative sizes of the holders and the equipment that can be furnished with them are presented. Mention is made of the special taps that can be supplied for use with the holder.

**Jet Condensers and Vacuum Pumps.**—Scranton Pump Company, Scranton, Pa. Bulletin No. 103. Covers a line of independent and duplex jet condensers and single cylinder and duplex wet vacuum pumps. All of these are illustrated and briefly described and tables of specifications for the various sizes that can be furnished are incorporated. Drawings of the condensers and pumps numbered to correspond with a list of repair parts are included.